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# PSYCHOLOGICAL ISSUES

Vol. I, No. 3 1959 Monograph 3

# ON PERCEPTION, EVENT STRUCTURE, AND PSYCHOLOGICAL ENVIRONMENT

*Selected Papers*

*by*

**FRITZ HEIDER**

INTERNATIONAL UNIVERSITIES PRESS, Inc.
239 Park Avenue South New York, N.Y. 10003

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First Printing 1959
Second Printing 1967

# EDITORIAL STATEMENT

In the last twenty-five years psychoanalytic interest has ranged far beyond psychopathology and the therapeutic process. As Heinz Hartmann has put it, "We no longer doubt that psychoanalysis can claim to be a *general* psychology in the broadest sense of the word." The Editors of *Psychological Issues* believe that a new kind of journal is needed which will publish diversified source materials for a general psychoanalytic theory of behavior.

The Editors believe that relevant contributions can come from experimental studies as well as from clinical ones, from controlled developmental studies as well as from the genetic explorations of psychoanalytic therapy, and that investigations carried out without any concern for psychoanalysis may nevertheless contribute to the theory. In *Psychological Issues,* readers who are particularly concerned with psychoanalytic theory will therefore come into contact with important research not ordinarily presented in psychoanalytic journals.

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The Board will consider only contributions submitted on invitation. There is at present no provision for consideration of unsolicited manuscripts.

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Subscriptions should be sent directly to the publisher, International Universities Press, Inc., 239 Park Avenue South • New York, 10003 . Editorial correspondence should be sent to the Editor, Dr. George S. Klein, Research Center for Mental Health, New York University, Washington Square, New York 3, N.Y.

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# A NOTE TO THE READER

Fritz Heider's work has belatedly been attracting a steadily growing circle of admirers. It has had over the years a significant, if relatively unobtrusive, impact on some of the most important theorists of our time, notably Kurt Koffka, Kurt Lewin, and Egon Brunswik. More recently, Heider's influence has been detectable in perception theory, for example, in the work of James Gibson. Still, his writings cannot be called "popular."

The paradox of the relative obscurity of Heider's work among psychologists generally and the esteem in which it is held by those familiar with it is perhaps in keeping with the contemporary psychological scene. These are restless years in psychology's history, with quick infatuations, equally rapid disenchantments, and an unscholarly impatience for dramatic returns. There is, moreover, the tidal wave of published words, pressing relentlessly on one's professional conscience, and allowing barely time enough for scanning the immediately relevant, let alone more. It is natural enough, I suppose, for so many of us to take refuge in the easiest means of survival, of reading little at all or only the most easily read. In the general skirmish for readers, it is understandable that author and reader alike fall victim to Flesch counts, promotional zeal, the eye-catching metaphor, and the high-sounding Intervening Variable. In the general din, what fate can we expect for one scholar's grudging output of papers, widely separated in time, tightly—even difficultly—written, bone-dry of polemic and of the dazzling metaphor, and disinclined to promote the potential significance of his ideas beyond the immediate context? It is to be hoped that Heider's influence will be broadened and accelerated by the recent publication of his book, *The Psychology of Interpersonal Relations* (New York: Wiley, 1958). This latest and most ambitious of his works brings to fruition, in a theory of how people perceive other people, germinal ideas that were formulated more than thirty years ago in "Thing and Medium" and "The Function of the Perceptual System."

These two papers, recognized by specialists as classics in the literature on perception, appear in the present monograph for the first time in English. One would have to look far and perhaps unavailingly to match them for their detailed exposition of the differences between the "things" or "objects" of perception and the carriers or "mediators" of things, considerations that help deepen understanding of Koffka's and Brunswik's more popular distinction between "distal" and "proximal" stimuli. The two papers contain the most probing analysis of the nature of "stimulus" to be found anywhere. These and other papers in the present collection have an obvious relevance to a variety of current issues in the fields of perception and thinking, and are an indispensable background for an understanding of Heider's book.

A few further words of introduction are in order for the psychoanalytic reader.

The papers in the present monograph are particularly relevant to some of the least investigated yet most pressing problems of psychoanalytic ego psychology—reality testing, adaptation, and structure. Anyone who ponders the concept of "reality testing," with its implication that reality *can* be perceived on its own terms, quickly runs up against paradoxes and dilemmas that are very much unresolved in psychoanalytic theory. For one: if reality is a subjective structure, what does it mean to say that we can effectively contact the *environment's* structure? For another: How can drives play so pervasive a role in the organization of psychic structures and yet our perceptions be as *effective* as they are? Is it not remarkable that perceptual processes *can* reproduce the environment's structures relatively uncontaminated by wish and drive? The starting point for all such questions is a conception of what the structure of the environment itself is, a problem which psychoanalysis is only now beginning to face as it emerges from its preoccupation with the internal environment. Similar problems of specifying environmental structure bedevil psychoanalytic efforts to come to grips with the issue of adaptation.

This very issue of environmental structure stands at the center of Heider's work, and that is why the editors felt it so important to bring this work to the attention of the psychoanalytic reader. Heider's emphasis on the "*macro*physics" of things (in contrast to the reductionist emphasis on *micro*physics), the important distinctions he develops between those parts of the environment which mediate ("medium") and those which are mediated ("thing"), his analysis of how we may distinguish behavioral events attributable to the structure of the environment and those attributable to the structure of the perceptual system—all of these merit close study. It may be mentioned that these considerations are uncommon to most contemporary theories of perception.

Throughout the papers the composition of a "unit"—whether spatial, temporal, or causal—is of central importance to Heider's distinction between "thing" and "medium." The defining properties of a "unit," therefore, come in for extended and penetrating analysis. For the psychoanalytic reader there are implications of great importance to be derived from this discussion of the structure of units. In psychoanalytic ego psychology the concept of structure and the structural point of view have taken the center of the stage. Many problems first tackled by Freud in a dynamic and economic (energy) framework seem, in his own later writings and in those of others, to be essentially structural in nature. And yet the concept of structure itself, for all its currency in contemporary psychoanalytic vocabulary, has not yet been subjected to thorough theoretical scrutiny. Perhaps a necessary preface to such scrutiny is an attempt such as Heider has made to penetrate the essential nature of the concept of structure. The general properties of physical macrostructures which he describes may apply to their subjective counterparts in ego organization.

A unique feature of Heider's approach is his attempt to fathom environmental structure not from the response side—from the inside outward, as it were, as is common in psychological theories—but from the outside inward, that is, by specifying the architectural rules of the extrapersonal world of physical object and event units. The result, then, is an extraordinarily fresh confrontation of the external structures which are assumed but never specified in psychoanalytic notions of reality testing and adaptation.

George S. Klein

# AUTHOR'S INTRODUCTORY REMARKS

The first paper which is presented here in translation is mainly concerned with the problem of how information about the vitally relevant environment reaches the perceiving person. In other words, it deals with the process which starts at the perceived object (the distal stimulus) and which ends with the stimuli impinging on the sense organs (the proximal stimuli). This process lies entirely in the environment and goes on whether or not there is an organism affected by the proximal stimuli. It belongs to what Brunswik has called the ecological phase of the causal sequence. It precedes the phase which occurs within the organism and which so far has been the focus of attention in most studies of perception. Since perception is adapted to the environment, it is obvious that we must be familiar with the environmental structures to which it is adapted if we are to get a comprehensive understanding of it.

In working on this problem it soon became clear to me that in order to describe the processes which link proximal with distal stimuli in a way that is relevant to perception, one has to go beyond the mere statement that the proximal stimulus is caused by the distal stimulus. One has to use concepts which have to do with the coordination of manifolds, with order and disorder, with the domination of one system by another, and with constraints: that is, one has to use the concepts which have been elaborated and sharpened in recent years by the new developments of information theory and cybernetics.

However, at the time when I wrote this paper a layman could not get much help from physics and my attempts to get relevant references from physicists were not very successful. In offering this paper at the present time I have to apologize for its amateurishness, and I can only hope that some day its ideas will be expressed in a more exact language.

The second paper, which deals with the function of perception, is a continuation of the first. It is mainly concerned with the processes in the organism, and with the adaptation of these processes to the ecological phase of the whole causal sequence of the perceptual event. Some of these problems had been touched upon in "Thing and Medium"; here they are elaborated, though the basic concepts used are again those having to do with transmission of variety.

The third paper was written recently. In it Russell's theory of perception is brought into relation with the ideas expressed in "Thing and Medium," and in addition the function of economical description in perception is considered. The following question is raised: if it is true that perception often exhibits a tendency toward "Prägnanz" or toward "economical description," how can we relate this feature of perception to the fact that perception, on the whole, leads to veridical results? What properties of the structure of the environment correspond to this general tendency of the perceptual apparatus toward economical description so that the adaptation of perception to the environment is assured?

In the paper on "Environmental Determinants in Psychological Theories" an attempt is made to relate a number of theories to each other. Some of the concepts developed in the two first papers, especially the distinction between proximal and distal stimuli, and the relation between core events and offshoots, provide the background for these considerations. One might say that the results of the analysis of perception were helpful for the comparison of theories in two ways: on the one hand, perception and theory building are both cognitive activities, and one may therefore expect that they will show some similarities. For instance, the data on which theories are built would be analogous to the proximal stimuli in perception, and the theories analogous to percepts. On the other hand, the difference between proximal and distal stimuli (and distal effects) will provide different possibilities for the organization of data: either proximal or distal variables can be considered as the focal variables.

The fifth paper is only indirectly related to the previous ones. In reading Proust one is struck by his excellent phenomenological descriptions and by the fact that in many cases these descriptions are apt illustrations of phenomena pointed out by Gestalt psychology and developmental psychology. A number of these descriptions are presented and discussed.

The paper "On Lewin's Methods and Theory" was given as the Kurt Lewin Memorial Award Address at the meeting of the American Psychological Association in Cincinnati in 1959. Starting with a discussion of some early publications of Lewin, this talk is mainly concerned with his ideas on the role of psychology and his concept of life space.

## 1

# THING AND MEDIUM

We are aware of our environment, but not everything that surrounds us is of equal value for the processes of perception or cognition involved in this awareness. We perceive things that are in immediate contact with our skins and we are often aware of one thing through something else. For instance, we see stars through empty space; we hear the sound of a bell through the air; we measure the pressure of air by means of a barometer; a person's expressive movements tell us something of what he is, etc. These cases are not entirely equivalent, but what they have in common is that the object of perception or cognition does not affect the sense organ directly but by means of some kind of mediation.

All this is well known and has been investigated extensively, but only in so far as the subjective side is concerned. Studies have been made of the psychological processes intervening between "sensations" and "images"; but in exploring this psychological aspect the objective physical aspect has been entirely neglected. The question has never been raised whether something that serves mainly as a mediator has not, from a purely physical point of view, characteristics which are different from those of an object of perception. When the ticking of a watch is the object of perception, the vibrations of the air mediate between the watch and the ear. Are the

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This paper was published in 1926 in the German journal *Symposion* (Verlag der Philosophischen Akademie, Erlangen, 1:109-157). In the following translation a few sections have been shortened. The only change that has been made in the content is a terminological one. In the original text the terms "thing" and "medium" are sometimes used to indicate the distinction between mediated and mediator, sometimes the distinction between solid bodies and intervening space. In this translation we have used the terms "object" and "mediator" for the first distinction, "thing" and "medium" for the second.

The author is greatly indebted to his wife, Grace M. Heider, for help in translating this paper.

two processes, i.e., the ticking and the vibrations, equivalent? Could they exchange their roles in regard to the process of perception? Does the one process act as mediation only because it is closer to the ear than the other process? Or are there differences in the physical structures themselves (regardless of the possible relation to a perceiving organism) which determine whether they play the role of objects or mediators?

We shall see that such structural differences actually exist in the physical world, and try to find out to what extent the nature of the processes of perception and cognition are determined by them.

### *Distance Perception*

The examples cited above have in common the fact that mediation is involved in all of them; but the way in which this mediation is represented in consciousness is very different in the different cases. The barometer which informs us of the air pressure appears in consciousness as something in its own right. The vibrations of the air, on the other hand, are not represented phenomenally in this way. They spend themselves, so to speak, in the process of mediation so that we believe that we hear the ticking directly. In this case we are ordinarily not aware that mediation exists. The mediation of light waves is of the same nature. We do not perceive light waves as things that touch our eyes and refer to something else. We seem to see the mediated object directly.

In order to comprehend fully what distance perception achieves, let us assume that there exists a thinking being to whom the processes in a small limited region of the causal texture of the world are known, and who tries, by scientific methods, to deduce from these processes the nature of the wider world which surrounds him. This task seems to be almost impossible; yet this is actually the task that our organs of perception perform to a considerable degree. It is the process in a very limited region that is at their disposal and that affects them immediately, and on the basis of this process they are often able to report on a very wide environment.

How is it possible that the region of perception does not end with our skin, that we obtain knowledge not only about the small narrow part of the world near us but that we live in a wider world that extends far beyond us? This question, of course, brings us back to our first question about the characteristics of objects and mediators.

### *Coordination Between Stimulus Pattern and Object Process*

Let us consider an example. For instance, I see a stone. The light rays which are reflected by the stone go through the medium until they meet my eyes. It is obvious that the stimulus pattern, that is, the configuration of light rays which meets my eyes, is coordinated to the object, the stone, in a special way. Even a very small change on the surface of the stone changes the stimulus configuration. It is not coordinated to any specific properties of the mediator, i.e., what is in the space between stone and eyes, as long as one can see through this space without obstruction. One cannot recognize from the stimulus pattern how the molecules of the air move, whether wind carries different masses of air, etc., and this is not the fault of the sense organs. There is actually almost nothing in the stimulus pattern that is coordinated to the changes in the mediator.

### *The Process and Its Substratum*

We gain more understanding of these facts when we consider the relation of the process to its substratum. Medium and stone are the substrata of the process; they stay at the same place and the energy wanders through and over these substrata and takes on different forms. The effect of this energy on the substratum varies from case to case. At one extreme is the case in which the process is coordinated to the substratum at a certain place. In whatever form the energy arrives, the process always assumes, at this place, the specific form of the substratum. We might say that such a substratum has a "strong individuality." Outside influences affect it only to a small degree. At the other extreme are cases in which the process is coordinated to what impinges on the substratum from the outside. Everything is taken over and carried on by the substratum. Many different events are possible in it. External rather than internal conditions determine the possibilities which are realized.

Thus we find that the relation between process and substratum can vary. The process may be internally conditioned and coordinated to the substratum; or it may be externally conditioned and coordinated to the impinging events.

For example: three little sticks can be moved independently of each other. If unequal forces are exerted on the sticks, then the three will move in different ways. This motion of the sticks is conditioned externally. However, if I make a rigid connection between the three sticks, they will all move together, and the fact that they move together is conditioned internally. In this case, it is irrelevant how the pressure is distributed. The three sticks will always move in the same way.

The process on the surface of the stone, which reflects the light rays, is a process which is conditioned by the substratum. What happens on the stone and how it happens is but slightly dependent on the particular properties of the impinging light rays, though the event is, of course, caused by them. From the moment at which the sun disappears, no further wave processes occur. But the fact that this particular kind of process occurs, namely, one which contains waves of particular lengths arranged in certain patterns, is determined by the properties of the stone.

The process in the medium, on the other hand, is conditioned externally. What happens in it is dependent on the form of the impinging process; the special state of the medium is to a high degree irrelevant for the form of the process in it.

### *Composite and Unitary Events*

Vibrations whose form is conditioned externally are called "forced vibrations," those whose form is conditioned internally are called "free vibrations." Forced vibrations have, besides the fact that they are conditioned externally, another characteristic, one which they have in common with most externally conditioned processes. Let us consider two cases of movements of a ball.

In one case a ball is pushed so that it rolls across a plane. In another case, the ball is guided by a hand and its movements are dependent at each moment on the movement of the hand. We are certainly justified in saying that the movement of the ball is more externally conditioned in the second case.

The difference between these two cases is the following: in the first case, an influence from the outside is active once, at the beginning of the event, and then the event takes place. Only the fact that the ball stays on the surface is conditioned externally, "forced upon it." In other respects the ball is "free." In the other case, when the ball is guided during the whole movement, the course of events is continuously influenced from the outside.

In the one case, the event forms a unit, that is, one part causes the next and is caused by the previous one. The parts of the movement are dependent on each other and cannot be separated from each other. In the second case, on the other hand, the event is a composite one, the single parts are to a high degree independent of each other, and there is no causal connection between the parts of the event since each part is caused separately from the outside.

All forced vibrations are such composite events in which a continuous influence is exerted from the outside. The vibration is guided by the external cause in each small section.

Free vibration is a unitary event. It is released by an external influence and then takes its course. The process which follows the striking of a tuning fork does not consist of parts that are independent of each other. With a forced vibration one wave could be missing, if the external influence were interrupted for a short time, and the vibration then start anew. With a free vibration, the dropping out of a part is impossible.

Here we can again use the example of the three sticks. If the three sticks are not connected, we can speak of a composite event. The movements of the single sticks are independent of each other. The movement of each stick is caused from the outside and there are three separate influences. If the three sticks are connected, their movement is unitary. In general we can say: a process which is to a great extent externally conditioned (i.e., coordinated to the influence from outside) often consists of parts which are independent of each other.

This holds not only for processes but also, for instance, for the position of parts of a body. The smaller the links of a chain, that is, the less the single parts of the chain are dependent on each other, the more closely it can follow a curve. A stick does not follow a curved line at all because it moves as a whole. A string can follow a curve even more closely than a chain because the position of its parts is largely determined by external conditions. In general, the parts of a pliable body are to a high degree independent from each other, the parts of a solid body dependent on each other.

We can experience this difference directly. We can feel a solid body through a soft one. In a certain sense, cloth is a mediator like the air-filled space through which we hear and see.

One can easily understand that composite events, whose single parts are influenced separately from the outside, are coordinated to external factors to a high degree. Each single element of the composite event has to be produced separately by the external factor and is therefore a messenger which tells about a property of the cause. And the more independent it is from its neighbors, the other messengers, the less is the message altered in the course of transmission. Since there is a multitude of messengers, each of which carries within itself something of the cause, they indicate the cause with a high degree of exactness and point univocally to it. A single wave impact could have been produced in its specificity by any one of many different causes; but the configuration of a manifold of waves could have been produced only by causes of particular properties.

### *The Spurious Units*

The wave which is enforced upon the mediator by the tuning fork shows still another characteristic. We have seen, first, that it is conditioned by external factors, and, secondly, that it is a composite event. But how is it possible to speak about the vibrations as a whole at all if it is really a composite event? We can do this because a forced vibration has the same geometrical characteristics as a free vibration. It appears to be unitary. The beats which are independent of each other nevertheless group themselves at regular intervals. They are arranged in a definite order, something which otherwise occurs only with things whose elements are dependent on each other and not with composite entities. Externally conditioned events often form spurious units because they are produced by a unitary cause. If each beat had an independent cause, it would be very improbable that the beats would show this kind of regularity.

### *Mediator Processes As Signs*

Now we can understand why certain processes can serve as mediators. The light rays which meet the eyes are messengers from the object and represent it. This representation of one entity by another is brought about by the close coordination between the two. The mediator processes which meet our sense organs are spurious units; they have unitary form not because of their own character but because they are coordinated to objects. If one does not refer them to their unitary cause, they are unexplainable. A manifold of light rays which has been produced by a source of light cannot be compared to an event, such as the fall of a stone, which also had its causes but which stands, so to speak, by itself. The light rays have no "reality" without their cause. They contain a strict order which cannot be attributed to the waves themselves since they are independent of each other. The situation is very similar in the case of the order in time of sound waves.

### *Language Mediation*

In this connection it is interesting to examine the properties of the different kinds of language mediations. In writing, for instance, a multitude of forms is produced by different combinations of relatively few elements, the twenty-six letters of the alphabet. The letters can be combined in many different ways because they are independent of each other.

This great number of symbols could also be produced in other ways. There could be, for each word or for each concept, a single sign which would form a unit and not be composed of different elements. Ideographic writing is an example of this method. Most systems of signs, however, use the device of combination in order to produce the necessary number of symbols. The principle of combining independent elements is also used in flag signals or in telegraphic codes. In these cases, the combination of units occurs not in space but in time.

The telegraphic code represents an extreme case. Its manifold of signs is produced by different combinations of just two elements. It is a script which employs only two letters. Again, the elements, that is, the dots and dashes, have to be independent of each other. If they were dependent on each other, if, for instance, an apparatus were employed which could send dots only in groups of four, or in any other fixed combination, the transmission of messages would be greatly restricted. The arrangement of dots and dashes must be determined by the sender, not by the means of transmission. If a combination in time is used, the temporal position of one element has to be independent of the temporal positions of the other elements.

### *Behavioral Significance of the Environment*

We have explained why some physical structures appear as objects of perception and some as mediators. The question now arises of how the perceptual significance of physical entities is related to their behavioral significance.

Not all parts of the environment are of equal significance for our action. We do not have to know how the particles of the air move, but the fact that a chair stands here and a table there is important and can determine our behavior. We have to be able to perceive a car that passes us in the street, the staircase of the house that we are entering. We need to know only a few of the infinite number of possible determinations of the environment in order to be adequately oriented about the possible relationships of our bodies to it. We live only in one particular level of this world; we have no relationship to many of the facts or events of our surroundings, they are not "real" for us. In order to gain more understanding of the significance for behavior of the structures in the environment, we must start with a discussion of the solid units among which we live.

### *The Units*

A chair consists of many parts. How is it possible that it is nevertheless a unit? It is not a matter of subjective apprehension that we combine this multitude of molecules in a certain way. It would hardly be feasible to apprehend one portion of the chair and a part of the adjacent air as a single object. Such a unit would have no meaning. On purely physical grounds the chair is distinguished from its surroundings. If a corner of the chair is pulled, the whole chair follows, but not the air in contact with it. There is a dependence between the parts of the chair which does not exist between the parts of the atmosphere. This dependence consists of the fact that a solid body does not easily yield to external influences. Its parts do not change their positions in relation to each other. Such a unit remains constant to a high degree. The particles of the air separate easily and constantly change their spatial arrangement. Even a swarm of mosquitoes can change it completely.

A change of the same extent in the parts of a solid object would mean its complete destruction. To be sure, a unit can also be taken apart, but this usually takes more energy than is required to move it as a whole. Not all these units are rigid. A coat, a hat, or a rope are units which are not rigid; but they too are things which stand out from the surrounding medium.

### *The Properties of Wholes*

These large units have specific properties as wholes. For instance, a string is something soft. If I take it and lift it, it will change its form in a certain way. If I take the two ends of the string and pull them, the string will be taut; it is then impossible to pull the ends further apart, but I can still bring them closer to each other and put them together. I can cut the string or unravel it—all these possibilities, and many more, are examples of properties of wholes.

Between these properties there exist laws and coordinations which are to a high degree invariant in regard to the properties of the elements. For instance, sphericity is such a whole property. It can be realized with an infinite number of combinations of particles. Each of these combinations has the further property that it can be rolled. A solid ball can always be rolled regardless of the material of which it is made. There are therefore correlations between different properties of wholes beyond the smaller parts and their properties. The exact determination of the relation of the units, which Köhler (1929) calls physical Gestalten, to the units which are discussed here will not be attempted in this paper. The stationary Gestalt in Köhler's sense is a system in equilibrium in which each part changes if another part is changed. Whether this is true in the same sense of a solid body is questionable. In any case, there are physical Gestalten which are not solid bodies. As Köhler emphasizes, these physical Gestalten are of great importance in the physiological processes; but structures like solid units play a more important role than these processes in the world which surrounds us and affects our behavior, and in the conditions of perception outside of the organism.

### *Parts and Hierarchy*

What units actually exist objectively? There are, first of all, tables, houses, and trees; furthermore, there are said to be molecules, atoms, electrons, etc. Then there are the astronomical units, the sun, the moon, etc.

These units are not all of equal rank. The many single tables, chairs, etc., belong to the larger unit of the earth. The objects which form units on the surface of the earth are of a different order of magnitude than the earth itself. The earth belongs to a higher order of unit, that is, the order of the heavenly bodies. Objects such as tables, chairs, and so forth, are subordinate to these units. A unit the size of a table is in turn superordinate to the smaller units of which physics treats. There is thus a hierarchy of bodies, the larger ones containing the smaller ones.

In other words, there are parts in the world. One could very well imagine a world which contains no parts, in which two units never stand in the relation of part to whole. Each unit of this world would be an irreducible element. There would be no superordinate units, that is, several units would never unite to form a complex for even a short time. But this is not the case with our world. It possesses a different structure with larger and smaller units; the larger units have parts. The things among which we live on the surface of the earth, to which we ourselves belong, and the laws of which are so important for our lives belong to one particular stratum within this hierarchy. They have their properties, which, as we have seen, are invariant in regard to the units of smaller orders. Thus there exists a stratum of relationships which contains only things of a certain order and which, on the whole, is without relation to the higher and lower orders. It is not particularly important for the larger units how the smaller units behave. There are few coordinations which connect the lower strata with the upper strata; we can find very few events involving the smaller units which have coordinated consequences among the thing units. A releasing process would be an example of such an event; for instance, a case in which an effect is released in the stratum of things by processes in the stratum of molecules. What would it mean for our world if such cases were frequent? It would mean that events of our everyday life could originate in a region that is below the threshold of our senses, in a stratum which is inaccessible to us. Influences from a mysterious nothing would produce changes in the objective scene. Suddenly a table which the moment before was entirely at rest would fall down, a chest would explode, or a hole would be burned in a piece of paper. We would say, "Things have the property of burning up or falling down easily without any perceptible reason." Properties like "explosiveness" would be much more frequent.

Fortunately, however, our world is much more exposed to our view, and for the most part it is possible to perceive the causes of events. A chest does not usually move unless there is a visible cause for its movement, that is, unless the cause belongs to the order of things. Causations which ascend from the stratum of smaller units into that of larger units are relatively rare. That is also the reason why man is without power to influence the planets and the stars. However much we move around, change or burn the things on the surface of the earth, none of the planets will be affected.

To be sure, collective events of a lower order can have effects on a higher order as in the case of wind, burning of gasses, etc. But then it is an aggregate that has the effect and not the single individual events. These processes really belong to the higher order.

One could easily suppose that the opposite case, in which causations descend from a higher order to a lower one, is of frequent occurrence, but this also is very rare. If the earth shakes, then the things in the rooms of men shake with it and fall; if I move my hand through the air, the molecules are pushed aside. But then the effects in the region of the smaller units are again mass processes, and it is difficult to find coordinations which connect a particular event of the lower order with a particular event of the higher order. There may be certain movements of the earth which have only the effect of making a specific chest or table fall down. However, they are not characterized as special events in other respects. The fall of objects during earthquakes is only an accidental part of a mass event. In the same way, it is not probable that I could produce definite molecular events by the movements of my hand, for instance, make a certain molecule move in a particular way.

One could suppose that in the case of freely falling bodies there is a causation in which a larger unit affects the region of things. But as in the previous examples, terrestrial gravitation, too, produces only mass events in the lower stratum. The bodies are all more or less heavy, and again there is no coordination between particular events. Moreover, gravitation shows a special property: it is constant for the things on the surface of the earth, and therefore it cannot be a true cause of events, even for collective mass events. In naïve thinking, the effect of this constant condition is not felt and is therefore neglected. Because it remains constant the relation to the earth is treated as a property of things, and in daily life a sufficient interpretation is that the fall of a stone is caused by the fact that its support is removed.

If we consider how difficult it is for the physicist to produce individual molecular events, and that in the end he is able to bring about only collective events in the lower order, we realize again the rarity of causal connections between events of two different orders of magnitude.

### *The Things on the Surface of the Earth*

Between the astronomical units there exist "simple relations," that is, relations which can be easily represented: the spatial-temporal framework is recognizable in the changes and laws of these units. The same is more or less true for the relationships between units of atomic and subatomic orders.

The things on the surface of the earth behave differently. They almost never move in regular curves. The gross simple relationships in which they stand to each other as gravitational bodies do not play an important role. The movements of these objects are never determined by the gravitational relation between them. The effects of this relation are nullified by the strength of the earth's gravitation, which, however, only rarely determines the movement of the objects; namely, when they are falling freely.

The movement of a freely falling body is one of the few events within our behavioral world in which the geometry of the free interaction of two units becomes evident. It exists as a latent property in the weight of the body. However, we have seen that the movements of freely falling bodies cannot be considered as a causal coordination between events of two different orders of magnitude.

Since the simple gravitational relationships between the units are nullified, it is possible that the more subtle and more manifold relationships, which come into play when bodies come into contact with each other, are of much greater importance. A ball is not very different from a cube in regard to its effects as a gravitational mass; however, if both of these units are held by gravitation to a larger unit, the difference between their forms is essential for their actual movements.

The organism lives and shapes its world among these smaller units, which we shall call "things." The things acquire manifold relations few of which are of a simple geometrical nature; for example, one can cut a string with scissors, but not with a rubber tube; and a coat can be cleaned better with a brush than with a knife. Of course these infinitely manifold relationships are produced by the organism; but it is probable that they are only possible with units which exist on the surface of a much larger unit. If there were an organism the size of the earth, it would be unable to create so many relationships within a system of planets of the same size, and therefore it would be impossible for it to create a livable environment.

### *Processes in Thing and Medium*

Examples of thing events are easy to find. A stone falls, a car moves, etc. Each movement of such a thing unit is an event of this sort. These are the events that are important for our lives and of which we must be aware.

In the medium we find wave events and also movements of the small units, but we know that these events are irrelevant for the things of our order of magnitude. Therefore, where there are only these units, there is "nothing" as far as we are concerned; a room which is only filled with air is called empty. If a stone falls, it falls until it hits a thing; if I let a ball roll over a surface, it rolls until it collides with a wall or another solid body. A stick moves through the air until it hits the ground.

Thus not all events are of importance for us. Much occurs in our physical surroundings which is irrelevant for our behavioral world. The media are filled with units of a lower order, but empty as regards our order. Only thing events are of importance for us

### *Behavioral Significance of Wave Events*

The wave events within the medium are significant for behavior only in so far as they are coupled with something important. Whether light rays pass through the medium in which we move about or not, and what kind of light rays, is irrelevant for our movements through these media. The light rays are important only in so far as they inform us of things. Otherwise they are unimportant. We do not collide with them; they do not hurt us in any way. They do not suddenly produce a motion of a paper or obstruct the course of a ball. Within the order of things we can usually assume that there are no events which are brought about by light rays, and exceptions, such as the radiometer, startle us. Sound waves, too, usually produce no effects among things. However long one shouts at a stone, it does not move. It is unusual for walls to fall at the sound of a trumpet, as happened at Jericho. While the thrusts of air waves set the larger units into vibration, they do not produce any events of thing order among them. Thus neither molecular events nor wave events have coordinated effects within the thing order. With the exception of collective events, there is nothing in the medium that is of importance for our behavioral world.

At the same time, the medium is of direct biological importance for physiological processes and the form of the organism. Water animals are built differently and move differently than air animals. But this is an effect resulting from a constant environment and is usually not represented in the behavioral world of the organism. We perceive only the differences of the environment which affect the organism directly, and not the medium as a constant surrounding.

This statement, like many in this paper, only holds in general, and one could certainly find single cases that are exceptions. These statements do not represent laws but only regularities which hold in most cases.

### *Wave Events*

Let us consider more closely the significance of wave events. The wave beats in the medium ride through the units: the molecules retain the same positions, the waves move on. What we have to consider as an identical event is not coupled to an identical molecular unit. On the other hand, when things vibrate, the event is bound up with the static unit. Identity of event and identity of thing go together. Because things can vibrate freely, wave events are coordinated to the order of things; they are not coordinated to the order of molecules. Wave beats ride through the molecular events without being affected by their particular properties. The free vibration of a thing, on the other hand, possesses a certain wave length which is characteristic of that thing. The waves which go through the medium are therefore coordinated to the things.

The fact that free vibration occurs in things, forced vibration in media, and that the wave events are coupled with our behavioral world, is of great importance. Thus things can easily be the objects of perception, since they are internally conditioned; and the externally conditioned media can serve as mediators. This is demonstrated by the exceptions. There exist nontransparent media and transparent things. The fog is something which has no importance for us as a thing. One can move in it as in "empty air"; but the coordinations of the light waves to the things are destroyed by it. Another exception is glass. It does not impress its own characteristics on light waves; it lets them pass through and transmits them like a medium. But it is a thing unit, a solid body. These exceptions are of behavioral importance. Sailors and mountain climbers perish in the fog and birds die when they dash themselves against a window.

### *The Light Waves*

It has been said above that there exists in the mediator a multitude of events that are independent of each other. What does this imply for light waves? It implies, first, that the events that follow each other at a certain place are not coupled. Vibration *c* does not follow *b* in a way which is characteristic of the place, as it would in vibration. An external influence has to produce each successive vibration. If the impact stops, a few vibrations still follow because of inertia, and inertia makes for a certain amount of free vibration in the medium. If the vibration were completely coordinated to the external influence, it would stop at the moment when the influence stopped. It is this remnant of free vibration which impairs the efficiency of the mediator, but it does not alter the fact that the frequency of the vibration is completely determined from the outside and that the better and the more transparent the mediator, the more completely the properties of the vibration are conditioned by the impact. If, for instance, the mediator is blue, then the frequency is conditioned to a greater extent by the mediator than when it is completely transparent.

Furthermore, the waves in two adjacent places of the mediator are likewise independent of each other to a great extent. If a red ray goes through the mediator, this does not imply that the neighboring ray is likewise red. Wave frequencies and other determinations are coupled only to a small degree, if at all. To be sure, there is a dependency in the mediator; what occurs at one place is dependent on what occurred the previous moment at the neighboring place. This kind of dependency is what makes the mediator capable of transmitting impulses.

Let us now consider wave events which occur on the surface of things. To what extent do they form units with parts which are dependent on each other? Certainly the temporal succession of vibrations on a given point of the object is caused by the behavior of the light source. The beginning or cessation of illumination tells us nothing about the object. However, the kind of vibration and its frequency are characteristic of the thing. To be sure, it can be influenced by differences in illumination, but not as completely as the vibration of a mediator. One cannot illumine vermilion in such a way as to make it look green.

It is very important that the order of the direction of light rays is changed at the surface of an object. All rays, whatever directions they come from, are absorbed to produce the one vibration which conforms to the surface of the object at each point. The rays are not reflected independently of each other as far as direction is concerned. In the case of the mirror, however, they are reflected independently of each other. A mirror changes the direction of light rays; but it changes the direction of all rays in the same way so that the configuration is preserved. At each point there is a multitude of rays of different directions, and the composition is determined externally. With an object which has not the properties of a mirror, however, the kind and direction of incoming light rays are more or less irrelevant, if only enough energy reaches each point to set its own free vibrations in motion. There is a similar difference between a colored object and a piece of colored glass. A piece of colored glass acts as a filter. Only one particular kind of light wave can pass through, but it does so without being changed. A colored object changes the directions of the rays too, so that the directions of the reflected rays are not coordinated with the directions of the arriving rays.

However, a solid thing has not one but many points. Can we consider the sum of wave events at all these points as a unit? No. It is a composite event. It is possible to illuminate each single point separately and, by using different illuminations, to force upon the thing entirely arbitrary configurations. For example, consider what appears upon the motion picture screen simply as the result of selective illumination. In these cases, the screen serves as a mediator. We do not see the screen; we see something else. And that again is only possible because the single events on the screen are independent of each other. But such complicated illuminations are the exception. In spite of the fact that the waves at the single points of a solid body are independent of each other, nevertheless in a certain sense they form a unit, because the points themselves are part of a unitary object. The substrata of the many separate events form a unit; and, in this sense, the vibrations, too, are dependent on each other. If an illuminated body moves, all the vibrations on it move in a certain order. Here again we find this important relation: freely vibrating points form a static unit and they are dependent on each other; or, in other words, things show free vibration, media show forced vibrations.

We can also put it in this way: not only is the manifold of light rays which are reflected from single points a spurious unit, but so is the much more complicated manifold which is reflected by the many points of a solid body. At first sight, one might question this statement and ask: what order or regularity is in this manifold? A spurious unit is an ordered manifold made up of units which are independent of each other. The order exhibited by the manifold of light rays which are coordinated to a thing is not of such an obvious spatial or temporal kind. Nevertheless, the light rays are coupled because they are reflected by coupled points. These light waves always appear together, although somewhat changed as a result of their illumination, position, etc. They contain an order which becomes meaningful only if one refers them to the corresponding object.

### *Sound Waves*

If we consider these relationships as regards sound waves, we find that things often serve as mediators for sound. One can hear through a wall. In this case the wall assumes mediator characteristics: it transmits unchanged the vibrations which are forced upon it by the source of sound. Therefore the whole event is coordinated to the source of sound or to what happens at the source of sound. Only a few changes occur which are characteristic of the mediator; for instance, when a sound is damped. Damping can be produced by mediation, but it is very improbable that the mediation creates new spurious units.

We find not only cases in which a thing mediates sound waves, but also cases in which the air, which usually acts as a mediator, apparently vibrates freely. The sound of a whistle is produced by the vibration of a column of air. However, these vibrations are not coordinated to the units of the air, that is, to the air molecules. It is not characteristic of these particles of the air to vibrate in such a way. The vibration is determined by the form of the column of the air and this form is forced upon it by the shape of the solid whistle. Therefore the free vibration is characteristic only of the solid body, the whistle.

### *Olfactory Mediation*

So far, we have only considered distance perception which is made possible by waves. But we perceive distant things also by the olfactory sense where waves are not involved. In this case, too, there are messengers, particles diffused in the air which refer to and are signs of something else. In this case, too, one can easily show that the messengers can act as signs only because they are independent of each other. A single particle, or many particles coupled to each other, can tell us very little about the distance of the body from which they are released. However, if there are many independent particles in a medium which usually does not contain these particles, then they disclose the nearness of the body in question. A single feather floating in the air does not tell us that there is a bird close by, nor do several feathers which cling together, because a single feather or a cluster of feathers remain a unit even when they are carried to a distance by the wind. The case is different when many single feathers float in a group. The more distant they are from the solid unit from which they came, the bird, the more they distribute themselves over a wide area, since their movements are independent of each other. Therefore we can infer from the presence of a cloud of feathers that the bird is not very far away.

Olfactory perception functions best in the open air (tracking of animals) because there the greatest independence of parts is possible. When the diffused particles are enclosed in a room, they do not refer so unequivocally to their source. The more tightly the room is closed, and the longer the odor remains in it, the less it tells about the nearness of the source. The cloud of independent particles which remains around an odorous body can be compared to the spurious units of wave configurations. The particles behave as if they were coupled or as if they were a unit. Actually they are independent of each other, and their clustering in one place would be highly improbable if this spurious unit were not conditioned externally by a true unit, the solid odorous body.

### *The Tactual Object*

One often hears the following argument: it is arbitrary to assume that a body is located where it affects the sense of touch. Why is it not also present where it affects the visual or auditory sense? A body consists essentially of its ability to produce effects, and it can do this through a wide area by means of light waves. Therefore a distant thing is also present right in front of the eyes through which it is perceived. However, if one accepts this line of reasoning and takes existence as equivalent to the possibility of producing effects, the resulting concept of boundary is very different from that which is used in ordinary experience, and which probably is the only meaningful one. Our perception sets the boundary of a unit at the point where the parts which are related to each other as interdependent parts of a solid body meet those other parts that are not dependent on the parts of the solid body in this sense. We not only touch the boundary of an object there, we see it there and not just before our eyes. Thus the eye localizes in the same way as the sense of touch.

One must not forget the difference between direct and mediated effects. The sense of touch is affected directly by the unitary thing whose parts are dependent on each other. The eye is affected by an atomistic manifold, a spurious unit, which is coordinated to the thing, but which itself can produce no effects in the realm of things. The light waves are messengers which have separated themselves from the unit and whose characteristics have been derived from it, but whose further fates are entirely independent from each other and from the source. A thing is not necessarily present wherever there are effects which are coordinated to it, and we are entirely correct when we do not localize the thing wherever it produces mediated effects. The epistemological significance of the sense of touch comes from the fact that the thing units affect it directly and not through a mediation. Therefore we always believe that we are closest to the thing when we touch it.

### *Mediating Things*

Within the things themselves we find internally conditioned events, core events, and externally conditioned events, which are composed of the offshoots of a central event. The offshoot event can always stand as a sign for the core event. This is the case, for instance, when one sees a mole digging through the earth. The thing that we see directly serves itself as a mediator. What we hear, too, can be the mediator for something still more distant. For example, in the woods one can tell from the snapping of the branches that something alive is approaching.

Measuring instruments, such as thermometers, barometers, electrical measuring instruments, etc., function as mediators and inform us of data which are important to us. The less internally conditioned the position of the parts which indicate something else, the better mediators will they be. In an apparatus which serves as an indicator, there must be a flexible element which yields to influences from outside, that is, a mediatorlike element. To be sure, measuring instruments are not common mediators which simply transmit the influence which affects them. They are to some extent internally conditioned; they abstract certain properties of the influence and change them into forms which can be perceived with a greater degree of exactness. The transposition has to occur in a strictly coordinated way. That means that changes of the position of the pointer must be coordinated exactly to changes of the influence. Such a coordination is typical of mediators: the successive positions of the pointer are not connected in a way which is characteristic of the pointer itself, but they are externally conditioned.

### *Traces As Mediators*

Something static, too, can serve as a mediator, and such mediators are generally called traces. Changes in the position of parts of solid bodies, or changes on the surfaces of soft materials are traces through which we can recognize their causes. Again we find the same relationships. The trace is the more characteristic of the source the more possibilities of change the mediator had at the moment at which the trace is produced, that is, the more it pictures that which produced the trace. If internally conditioned solid units such as stones are present in clay, the impressed traces are relatively less characteristic of the cause than traces in pure clay. If the substratum of the trace loses its mediator characteristics and becomes a rigid body, the trace becomes permanent and the material cannot serve for further mediation. This is what occurs in every "fixation," whether applied to a photographic film or a drawing; the hardening of a plastic mass in casting serves the same purpose.

### *Reproduction*

If one models a piece of clay so that it resembles a thing, it is plausible that the offshoots of this piece of clay are similar to those of the original, and that we recognize the original in the reproduction. The reproduction consists, in this case, of a unit which is similar to the original. A photograph is a square piece of paper with black and white spots. Nevertheless, it can be made to represent an infinite number of things. Thus a manifold of offshoots corresponding to the original is sent out by a thing which is entirely different from the original.

The light rays which proceed from a thing are conditioned by its form, its surface characteristics, and the illumination. If one wants to produce the representing light rays by form alone, one obtains a plastic reproduction, a form imitation of the original. If one excludes the factor of form (by using a plane surface), and of illumination (by equalizing the illumination), and wants to produce the representing light rays by changes of the surface characteristics, one obtains a picture in the narrower sense of the word. If one uses only the factor of illumination with the exclusion of the factors of form and surface characteristics (by using a plain white wall), one obtains a projected image. Illumination and surface characteristics are usually not coupled with the behavioral significance of a thing, as is the case with its shape. Therefore, by changing these two conditions, one can change, to a great extent, the light rays which are reflected by a thing, and one can give them an order which imitates a light-ray manifold characteristic of another thing.

If the reproduction is produced by an apparatus, the process is essentially as follows: one lets the offshoots produce a trace. This trace must be such that of itself it sends out offshoots which are similar to the trace-forming offshoots. In this way the offshoots are fixated, for the substratum of the trace can become a rigid body: the position of its parts is not changeable, and it retains its characteristics in a changing environment. It is a fixation of spurious units, that is, a fixation of the mediation.

A phonograph fixates a multitude of offshoots which are temporally distributed. With such a fixation, each point in time has to be coordinated to a point of the trace. Thus the temporal manifold is transformed into a spatial manifold of traces which are independent of each other—independent in so far as the form of one point of the record does not condition the form of a neighboring point. A temporal multitude cannot be fixated immediately, that is, be made into a unit which remains constant in the face of changes of the environment. If one wants to make it static, one must transform it into a spatial configuration which is bound up with a rigid unit. To be sure, there are static units, rigid bodies, to which are coordinated temporal successions and which can be reproduced at any time without the presence of a spatial configuration corresponding point for point to the temporal one. That is the case with a freely vibrating body; an event is coordinated to it and can be reproduced at any time. This event is a unit, not a composite which consists of externally conditioned elements, as is the case with the vibrations of a phonograph needle. Actually, however, it is impossible to find bodies whose free vibrations consist of a piece of music which is reproduced when one strikes the body. It is therefore necessary to use composite coordination if one wants to fixate a temporal manifold, that is, to attach an event to a solid body. When a spatial manifold unfolds into the temporal one, it has to be collected into a unit, which, in the case of the phonograph, consists of the needle and the sound box.

With moving pictures, also, the temporal manifold is transformed into a spatial manifold, and an event is preserved as a solid body. The properties of the solid body, that is, the film, are forced upon it by the core event, i.e., the event which is represented in the pictures. The spatial manifold can again be unfolded and the screen functions as a collecting unit, corresponding to the phonograph needle.

### *Expression of Personality by Movement and Action*

This process of transmission appears in its most striking and complicated form in connection with human personality. Each personality radiates a multitude of significant offshoots and is surrounded by a halo of traces and events which have taken on the characteristics of the unity of the person.

The single actions of a person can be thought of as the parts of this spurious unit; they are independent of each other in the sense in which light rays issuing from one source are independent of each other. When a person raises his arm, the sequence of the arm movements is not determined by the properties of the arm itself. The person may lift it still further or may let it down. To this extent, the single movements are not directly dependent on each other. As the light rays become meaningful only by reference to the unitary source, so actions become intelligible only if one refers them to the underlying objective unit, that is, the person or the performer and the sequence of psychological events within his person. The case is made more complicated by the fact that the achievement of the action acts back upon the person, so that there is an indirect dependence of the single actions on each other. But this dependence does not lie in the internal conditions of the executing organ.

Expressive movements, too, are the more significant the less they are internally conditioned. Therefore facial expression is especially important because the anatomical structure is such that many different combinations of movement are possible. Traces can also serve as mediators for inner-personal processes. From footprints to the most complex traces, such as handwriting or artistic or scientific creations, there are manifold mediations through which we can recognize the personality and the intentions of a person.

### *The Functions of Perception*

We have considered the structure of the environment in regard to perception and cognition. Now we can try to understand the meaning of the perceptual apparatus. We shall first consider the physiological event which corresponds to the final product of a perceptual process. This event must be coordinated in some way to the stimuli or the stimulus pattern. If that were not so, the organism would live in an imaginary world. On the other hand, this event must have effects as a unit. It must stand as a whole in the chain of causal connections, and it must be possible to stimulate it as a whole from different regions (for instance, the image of a table can be aroused not only peripherally but also centrally). It can be aroused as a whole from different regions only if it is unitary; the more composite it is, the less is that possible—and on this fact is based the coordination of the composite events in the mediators to events in the objects. Thus the perceptual apparatus makes the object again into a unit at a place where its effects are only spurious units, which are coordinated to the object. The perceptual apparatus transforms these spurious units again into true units which have physical effects within the order of magnitude of things.

The light rays proceed from the things; they form a composite event, which, although it is coordinated to the unit of the thing, is not itself a true unit. The organism gathers these effects together and thus they become effective in the region of things; for instance, the organism moves around in a way which conforms to the solid bodies of the environment. The effect of the things remains latent and physically unreal in the medium. It appears again in the organism. Thus in the brain there is again something which is coordinated to the thing and which at the same time is physically unitary.

The fact that there is a perception apparatus in the world structure allows the things to have more characteristic effects. One can say that they become real to a greater extent, since they obtain new possibilities of having effects. For instance, what effect does a knife have on inorganic connections of thing order? It certainly acts as a whole, as a physical unit. It acts by means of its weight, it even acts by means of its form; that is, it can cut. But when does its form as a whole have a unitary coordinated effect on another body? One is tempted to say that this happens only when an organism is involved which recognizes its form.

### *The Synthesis*

The organism has to reconstruct the coordinated core event from the offshoots. That is the function of perception. We can now try to relate these considerations to the more familiar treatment of perceptual processes. The sensations, as they were understood by the older psychology of perception, are the immediate effects of the offshoots on the sense organ. They correspond to the events which make up the composite mediation. Their structure is atomistic because the mediation to which they are supposed to be correlated is atomistic, that is, composed of parts which are independent of each other. The reconstruction of the core events on the basis of the offshoots is a process of "synthesis of images out of sensations," of "Gestalt production," etc. The structure of the environment shows that such a synthesis is necessary; we can say that any being that is to recognize its environment by means of mediators has to avail itself of it. And if we want to construct an apparatus which would react to distant things through a medium in a coordinated way, we would have to build one that gathers into units the composite effects which have their source in the distant units. In this sense the synthesis is conditioned by the structure of the physical world.

### *Resonance*

In the mediator the wave events are mixed. The effects of waves proceeding from the single points of objects interfere with each other. If one holds a photographic plate in front of an illuminated object, it will be exposed more or less equally at all points. No coordinations are formed between points of the plate and points of the object. The combination of light rays coming from a chair is certainly different from one coming from a table, but the plate cannot register this difference. A certain order of light rays exists in the medium, but it does not become physically effective. The case is different if I hold a cardboard with a little hole which serves as a pinpoint lens in front of the plate. Coordinations are formed. The plate is now exposed in a specific way which is dependent on the nature of the object. The order that is latent in the medium is made physically effective, and this is the first step toward a meaningful unification of the effects conveyed by the mediator. This unification requires, first, that the mixture existing in the mediator be decomposed and the single effects be segregated so that they can become effective individually. Only after such an analysis can the real synthesis into meaningful units begin. This analysis of the manifold of events is performed by the more mechanical apparatus at the entrance of the sense organs, for instance, the lens, the compound eye, or the cochlea with its resonance apparatus. They respond only to a limited range of stimuli and exclude interfering events. Thus the single event is segregated. The single point on the film of a pinhole camera responds only to light rays of a certain direction. So do the facets of an insect's eye. The lens has an even more important effect in that it not only excludes what comes from other points of the object but also collects the composite event which comes from one point. This is the beginning of the synthesis. Of course it is only the beginning, for, although the lens reinstates the order of the points from which the light rays are reflected, it does not produce units which correspond to things. On the plate or just in front of the retina, neighboring points are all equivalent in atomistic order.

### *General and Special Apparatuses*

If the wave mediator were not homogeneous, and the waves did not proceed according to a general scheme, such a generally useful combining apparatus as the lens would be impossible. One can imagine an apparatus which would combine the rays proceeding from one point through an unhomogeneous mediator. In such a case where the medium was not uniform, a special apparatus would be necessary for each point of space. A duality which is of greatest importance begins in the lens. There is, first, the event itself, but secondly also its "meaning." The rays in some way refer to, or are coordinated to, the points from which they come. If the rays which proceed from one point are again combined into one point, they are guided "correctly," "meaningfully." This is analogous to the relationship of physiological to mental events. Two layers of functionally related processes are superimposed. The offshoots have to be combined into units, that is, the kind of combination is determined by laws according to which the offshoots are coordinated to the distant objects. But the physiological processes which perform this unification have their own laws also, regardless of what they achieve.

If a special apparatus were provided for each single case of the unification of offshoots, then the laws of the dynamics of the organism itself would play no part; a discrepancy could never arise between the two different layers if only the right apparatus were employed. Of course an infinite number of apparatuses would be necessary. However, the two levels could be related in another way: the laws of the physiological processes could agree in their structure with the laws of the level of meaning. An apparatus could, on the basis of its own dynamics, react meaningfully to many different stimulus configurations; that is, it could react by reconstructing the distant objects. Two different manifolds of stimuli would have as their effects two different central processes, not because they set into action two different fixed apparatuses, but because the same apparatus reacts in two different ways. As we have said, the lens of the eye is just such a general apparatus. In contrast to the more central nervous processes, its function is more or less rigid and it does not depend on previous experience or exercise. At the same time, we can improve our perception based on bodily equipment with manufactured instruments such as glasses, microscopes, and telescopes. As we have mentioned, this is possible because the light rays proceed according to a general scheme. Although they do not form a physical unit, they form a spatial unit. With spurious units whose parts follow a definite order in time or space, it is possible that a mechanically rigid apparatus performs the unification according to a general method. The case is different when we are dealing with spurious units whose spatial or temporal order shows no regularity. That is the case with the light-ray manifold which proceeds from a solid body. To be sure, there are some regularities that characterize the manifolds that are coordinated to things, but they are to be thought of only as typical occurrences and not as laws. The more special the coordination of offshoots to core events, the less probable it is that there exist physiological apparatuses which react meaningfully to different stimulus configurations. One might mention that Köhler has suggested that there exist physiological apparatuses which react meaningfully on the basis of their own dynamics to many different stimulus configurations.

### *Sensory Qualities*

The ideal case of such reconstruction of underlying units from the offshoots would appear thus: we open our eyes and see the room full of objects; we see the units of the thing order which are important for us. We see a table and we see that it is something solid which, however, can be moved as a whole. We see that one can put something on it. In short, the light rays mediate to us everything that is important for our behavior. We see the unit and its place within all possible relations and functions; nothing else is given to consciousness, the mediator does not appear to the subject.

On the whole, this is what actually occurs. However, this ideal case is never completely realized. It is not irrelevant for the phenomenon how the knowledge about the object is mediated. Light rays and sound waves which serve as mediators appear phenomenally as colors and sounds. Not only does the kind of mediation influence the images of objects; it is even possible to focus perception on the mediator itself. Although we can produce conditions in which it is impossible to refer the waves to some entity of the object world, they are nevertheless perceived as something specific and they are recognized. Even if the mediation transmits object units to us, we can disregard them (reduction).

We are not trying to solve the problem of why mediation appears at all phenomenally. Instead we turn to the discussion of another question. The mediation, that is, what affects the sense organs directly, is perceived as color, sound—in general, as sensory quality. Is it possible to relate the special character of sensory qualities to the role which the physiological correlates play in the whole process of mediation?

It is first of all characteristic of sensations that they are unitary in a special sense, which is different from that of a Gestalt. The quantitative aspect is important, and they are somehow "subjective"; a wave is perceived as color or sound. Does the physical structure in any way correspond to these facts? The waves affect the sense organ directly and as units. It is not possible to separate the crest of a wave from the trough in such a way that they have specific effects. They are the true units out of which the medium manifolds are composed. This may explain that such special phenomenal units are coordinated to the light waves. But does the subjectivity follow from this property? Let us compare the image of a "correctly" perceived movement with the sensory quality which is an "incorrect" subjective representation of movement. I see how a black dot moves. I can perceive this movement as a unit. Nevertheless, this unit is objective to a much greater degree than if the movement were perceived only as a special sense quality. We can assume that this objectivity consists in the relations to other objective events somehow being represented in this image. If I see a black point moving, I know immediately that this event belongs to the large class of events where something moves. And if, at another time, I see the movement of a big white cloud, I know immediately that this event has something in common with the movement of the dot. Thus I perceive the position of the event in relation to other events. If I perceived these two movements only as two different sensory qualities, the relationship between the two would not be directly given in perception.

What distinguishes the more objective perception from the more qualitative? The movement of a point can be something unitary. However, I can distinguish parts in it which also correspond to something objective. I see how it is composed of parts; I can see the different positions of the point, or at least these different positions are somehow embedded in the whole movement. That is not the case with color. I cannot recognize parts in it. For the corresponding physical event this means that there are part correlations with the point movement; not only the movement as a whole but also the parts of the movement have specific effects.

The kind of unification is entirely different in the two cases. The transformation of vibration into nervous excitation is a unification which has more the character of a summation, for instance, like the summation into a unitary vibration of strokes on a solid object. The individual effects of the single impact are entirely lost. One cannot segregate any part coordinations.

With the perception of thing movement, on the other hand, the direct effect on the sense organ is manifold. The retina is stimulated at many points. Even if interaction occurs at once between the points, this interaction does not make coordination to the single excitations impossible. The event which corresponds to the movement is, when it enters the sense organ, an externally conditioned event; it is composed of parts, which are coordinated to the single parts of the perceived movement. Starting with this manifold, the unification occurs within the nervous system in such a way that the single parts are to some degree preserved in the end product. One sees the whole and at the same time one perceives the way in which it is composed out of parts. It is then understandable that the one movement is seen in a way which corresponds much more to the objective movement than the other. If something objective corresponds to the parts of the whole, and if the way in which the whole is built up of parts is phenomenally represented, then the whole is recognized much more correctly. One could also represent these relationships in the following way: all influences which belong to an order of magnitude below a certain threshold are received as units; those which are above this threshold produce, as a first step within the sense organ, a composite event which allows for the possibility of analysis.

To be sure, the sense qualities, too, contain many traits which correspond to objective relationships. Light obtains its phenomenal value first of all from its function as a condition of perception. Light means "clearness" and "brightness," in contrast to darkness whose phenomenal value refers to the difficulty of getting about. Those characteristics of light which lie above the order of magnitude of the threshold of analysis are, of course, perceived correctly. To these characteristics belong the relationship of the source of light to a reflector, the fact that light always proceeds in straight lines, etc. We do not claim that all this is seen at once without previous experience, only that these characteristics are adequately represented in the direct experience of the adult. Only the finer structure below the threshold of analysis is inadequately perceived, and this finer structure is irrelevant for our behavior because it lies below the order of magnitude of things.

### *Figure and Ground*

The single offshoot, that is, the single unitary event proceeding from an object, can be coordinated to many different causes, or many different core units. We have seen that only a multitude of independent offshoots gives a more univocal coordination. If there are too few offshoots, they remain ambiguous, and they can be coordinated to different phenomenal units. Different core events can be meaningfully derived from them.

As an example of such "equivocality" we shall discuss the difference between figures and ground, about which there exists a considerable body of research. One can perceive a spot either as something which lies on supporting ground, or as a hole. What is the relationship of core unit to offshoots in the two cases? "Figure" refers to a solid body which is in front of something else. "Ground" is something that is unitary only in regard to the figure; it is what is behind the figure regardless of whether it consists of a multitude of objects or a white wall. Let us consider the coordinated light-ray event as it meets the retina. It is a spatial configuration of events which are equivalent as processes, although they represent entities of different values in the thing world. No specific characteristic exists which would distinguish all light rays which come from an object. The significance of one ray is only determined by its position among the other rays. The single ray becomes univocal only in relation to the surrounding pattern. Thus it can happen that with a change of surrounding field the significance of the single part changes. In such a case, if only the objects were represented and not the mediation, we would see only unrelated phenomenal objects following each other. It would be impossible to recognize any identity in this change, for only the mediation would remain the same. But the mediation can have its own phenomenal representation: the colors, and also the form in so far as it is not yet interpreted as figure or ground. This makes it possible for us to speak of something as being phenomenally identical in figure-ground reversals.

Thus the difference between figure and ground refers to objects, and if we see a black spot on a white paper as a figure, it means that we see it as a picture. For this reason, most ornaments have some object meaning. It is impossible to ask how it would be if we were to interpret the offshoots differently, that is, reverse figure and ground. That would be asking, "How would it be if we were to perceive solid bodies as air and the air as a solid body?" Figure and ground belong to the phenomenal qualities whose object significance is more or less known to us. One could, however, imagine such exchanges in regard to qualities; one could ask how it would be if red appeared as blue, because red and blue are not anchored in the thing world like solid bodies or figure and ground.

### *Mediation in the Motor System*

In discussing expressive movements, we compared the single motor impulses to the light rays which proceed from a source. We have seen that the comparison does not hold exactly. Nevertheless it throws some light on the process of motor mediation. The organs of the body which affect things directly must be as nearly as possible perfect mediators for the action impulses coming from the brain. We know what that demands. The coordination of the movements of the single parts must not be internally conditioned but must be determined entirely by external influences. The hand is the most perfect action mediator, and we recognize in it the general characteristics of the mediator. It is the more perfect the more the single fingers are independent of each other and the less rigid they are. If, instead of the hand, we had a solid body whose form were entirely internally conditioned, we could not grasp anything. The piano player or the mechanic notices the least deterioration in the mediator characteristics of the hand. When the hand is cold, it is internally conditioned to a greater extent and can no longer transmit slight impulses.

But not only the organs of one's own body serve to mediate action. Tools, machines, and even other people can transmit the impulse which comes from the acting person to the place where the essential event of the action occurs. As we see the thing through the medium, so we act through tools and are concerned only with the core event of the action without regarding the special kind of mediation. For the driver of a car, driving is not simply a turning of the wheel. This immediate effect of the movements of his hands loses its own meaning entirely, since it serves only as mediation for the further effect which is the core event of the action; namely, that the car at one time goes straight on, then turns toward the right, etc. The fact that he feels he can control this core event is again conditioned by the medium characteristics which the steering apparatus must possess. It must obey each slight pressure, it must not be internally conditioned to too great an extent. Other examples: a person who is writing does not think of himself as making black marks on a piece of white paper; he makes thoughts or feelings "objective." He makes them into something that one can carry around, in short, into a thing. If a painter puts oils on a canvas, he works through these mediations on the intention of his picture even if it is to be only an abstract painting.

Thus the organism does not stand in the causal texture like a thing that is pushed and pushes other things; it lives between two spurious units of composite process. This peculiar kind of causal connection makes possible new events in the world of things. It could happen, for instance, that from a heap of colored stones all the round blue ones were suddenly pushed aside into a separate group, but such an event would be most improbable if only the usual causal connections were effective. It is likely only if a human organism is involved. This kind of causal connection involving two spurious units, one on the perceptual and one on the motor side, frees the organism from gross physical relationships.

### *Summary*

Are there structural characteristics of the physical world which are important for perception? This was our first question. In order to answer it, we began by analyzing distance perception. We found that there exist mediators and the mediated objects. There exist cores, or units, which are internally conditioned and which are in some way centers of the causal texture of the world. These units are surrounded by something whose forms and processes are molded by them and which is thus externally conditioned. The centers are unitary, while that which is externally conditioned is mostly composite, built up of many parts which are independent of each other. These parts sometimes form spurious units, which become intelligible only by reference to the unitary cause. This structure makes it possible for events in the externally conditioned regions to inform us of the internally conditioned centers; thus it underlies the distinction between objects and mediators.

It is important that the mediated objects are at the same time usually thing units. The object-mediator structure agrees with the thing-medium structure in regard to its centers, and coordinates wave events to the world of things which is important for us. If one can see through something without hindrance, one can, in most cases, also put one's hand through it without meeting resistance. That which is "something" for the eye is usually also "something" in regard to relationships between things. Therefore it is possible that waves serve as mediators in the cognition of things. The relationship of mediator to mediated, which we found in the case of wave events, holds in general for mediation in cognition. In most cases, there exists a core event which is unitary, internally conditioned, and sends out offshoots which are mostly composite and atomistic. Through these offshoots, through traces, pictures, expressive movements, writings, etc., we apprehend the underlying units.

It is the task of the apparatus of perception to construct out of the manifold of impinging offshoots something that is coordinated to core events. This has been called the synthesis of images out of sensations. We have made the attempt to explain some characteristics of the "sensations" on the basis of the characteristics of their correlates among physical events. Finally, such mediation by means of a composite process exists for action as well as for processes of cognition. From our analysis one can say that the processes in the organism take place between two spurious units.

## 2

# THE FUNCTION OF THE PERCEPTUAL SYSTEM

### I

The purpose of this paper is to consider perception in regard to its adaptation to the environment, or, to use a term of K. Bühler's (1929), to analyze that "aspect of function" of perception. A start in this direction has been made in "Thing and Medium"; the present essay attempts to bring out more clearly the way in which these considerations can be helpful to a theory of perception.

Everybody will concede that the perceptual apparatus belongs to an organism which is adapted to the environment; nevertheless, in discussions of perception the structure of the environment is often completely neglected, and only the proximal stimuli (for instance, the wave length of the stimuli impinging on the organs) are taken account of. It is not asked whether these stimuli possess a certain meaning in themselves which can be understood only if their objective role in the environment is considered.

The description of this environment to which the perceptual apparatus is adapted is a problem of physical science and as such not part of psychology. The fact that it has been neglected is due to the present state of physics, which so far does not offer suitable concepts. In considering the environment in its relation to perception, one has to analyze its macroscopic structure, the meaning of the single process in greater wholes, and the interaction of causal chains—and these are questions which the physicist has so far avoided.

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Translated from: Die Leistung des Wahrnehmungssystems. *Zeitschrift für Psychologie,* 114:371-394, 1930.

We shall make use of a structural analysis in order to find out what in the environment is vitally important for the organism. There is always danger that this way of looking at things may lapse either into microscopic or into psychological concepts; we must make it clear that we are concerned neither with atomic physics nor with the environment "as it appears to the organism."

One might have misgivings about treating such a description as part of physics. But since no better word is available, the word "physics" will be used here as also referring to such a macroscopic description.

In "Thing and Medium" we tried to describe the structure of the environment which is essential for distance perception. If an organism is to perceive the environment, the mere possession of perceptual organs is not sufficient; it is also necessary that the perceiving organism and the objects of perception are in a certain way causally connected. Without this physical, extraorganismic connection, distance perception is impossible. In the analysis of the causal structure two concepts are of importance: the concepts of "internally conditioned" and "externally conditioned," which correspond to the concepts of "free" and "forced" vibrations in wave mechanics. That certain parts of the environment have the meaning of mediators through which we perceive something else, that we hear and see things "through air," that we recognize meaning through letters in reading, cannot be attributed entirely to the properties of our perceptual equipment. Something can be a mediator only if it occupies a particular place in the structure of the environment, and if it possesses the characteristics of a mediator independent of whether or not it is used by an organism as such.

A mediator is distinguished by the fact that its processes are conditioned from the outside: they cannot be explained without reference to something beyond the mediator. Thus physical nature contains the conditions for distance perception. A contrary role is played by the centers, the "cores" of the environment, of which the solid things are examples. These cores determine processes which are internally conditioned; they impose their form on the surrounding medium, which is permeated by causal offshoots coming from the cores. The cores as such can never serve as mediators in the cognition of the environment; they are the objects of perception and contain the vitally relevant processes.

Usually only the mediator processes impinge directly on the perceptual organs, and the vitally relevant core processes have to be reconstructed from them. The relation between stimulus and perceptual image corresponds in mirror fashion to the relation between core and offshoot. This correspondence is an instance of the adaptive function of the perceptual apparatus: a task which is set by the environment is solved in an efficient way. Just as thinking corresponds in some way to the logic of relations, the perceptual organs correspond to the environment which is to be perceived. Though the analogy must not be overstressed, it is permissible to say: just as it is impossible to analyze the thinking process without referring to its content, it is a mistake to study the psychology of perception without considering the tasks which originate outside of the organism but which the organism solves in a meaningful way.

## II

A good starting point for the discussion is furnished by an experiment of Rubin:

> In Figure 1, *R* represents a ring; *A* represents a wheel, the diameter of which is exactly half of the diameter of the ring. The wheel can move in the ring. One can demonstrate mathematically that all the points on the periphery of the wheel perform straight pendulum movements through the center of the ring if the wheel moves. Five positions of the wheel . . . are shown in the figure; the square and round marks indicate the five positions of two points. The apparatus makes it possible to illumine one to six points of the periphery. If the apparatus is set up in a dark room and only one point is visible, one sees it perform a pendulum movement; the speed is greatest in the middle. If two points are visible one can see two intersecting pen-

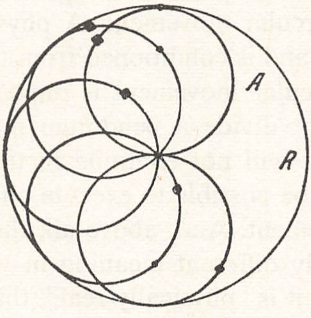

FIGURE 1

> dulum movements. However, if all six points are visible, one does not see six straight movements. One sees six points which all move uniformly in circular paths, these being defined by the six points; at the same time the whole system of six points performs another uniform circular movement the center of which is the center of the ring [Rubin, 1927, p. 388f.].

That means that the phenomenon which corresponds to a single stimulus is completely changed if one adds other single stimuli. If the single stimulus is given by itself, one sees a pendulum movement; if the same stimulus is surrounded by other stimuli, one sees a double circular movement.

We shall now consider the structure of the perceived object and the kind of mediation. Rubin seems to imply that the difference between the two phenomena—pendulum movement and double circular movement—has to be attributed completely to the perceptual apparatus, and he states expressly: "One or two movements are mathematically only two *façons de parler,* but psychologically they are two different realities" (1927, p. 390). However, a mathematical description which determines path and speed of a point is not sufficient for the description of the movement of a point on a thing if we want to describe the movement in terms of macroscopic physics as it is envisaged in the present paper. Though pendulum movement and double circular movement of a thing point are identical mathematically, they play very different roles within the macroscopic structure. Kurt Lewin has made this clear by referring to a similar example, and said, in this connection: "Processes which are closely related phenotypically can belong to very different conditional-genetic types" (1927, p. 398). A true macroscopic pendulum movement has properties and possibilities different from those of a double circular movement. A physically real pendulum movement is unitary and is conditioned from the inside to a greater degree; a double circular movement is imposed from the outside. Therefore one cannot divide a pendulum movement into pieces; if it is interrupted, it will not continue in the same way. On the other hand, it would be possible to execute only a small part of the double circular movement. And, above all, the rectilinearity of the path has a completely different meaning in the two cases. In the pendulum movement it is "physically real," that means it has physical significance, while in the double circular movement it is an unreal component of two movements and the rectilinear path is not a distinguished case, it is only one possibility among other not rectilinear paths. What Lewin says of his example can also be applied here: "The same mathematical function means epistemologically something different according to whether it is supposed to describe the process phenotypically, or whether one contends that it is a description of the genotype of the process. The mathematical representation by itself is ambiguous in this regard, unless the context makes it clear what is supposed to be described" (Lewin, 1927, p. 399, note). Our perception, therefore, does not produce a difference where objectively we find no such difference; to the two different psychological realities correspond two different environmental realities. If we call a physically real pendulum movement (i.e., an oscillation of a body produced by forces directed toward a midpoint) *P*, and an imposed double circular movement (i.e., the movement of a body attached to a wheel in a ring) *K*, then we can say:

*P* is mathematically equal to *K*
*P* is physically not equal to *K*
*P* is phenomenally not equal to *K*.

Under normal circumstances the phenomenal appearance corresponds to a high degree to the macroscopic physical processes, that is, one sees from the whole arrangement what significance the movement possesses; Rubin justly states that this perceptual analysis of movements is important, and classifies it with the constancies (1927, p. 391).

However, as the experiment of Rubin shows, *K* is seen as *P* in certain cases. One can show that the source of this "mistake" does not lie in the perceptual apparatus, but that the physical mediation is responsible for it. *P* and *K* are macroscopic thing processes from which offshoots issue; these offshoots impinge on the sensory organs and from them perception reconstructs the underlying processes. The mediating offshoots in this case are light rays, and it is obvious that these rays, coming from the single points, are determined only by the paths and the speed of the points, i.e., what can be mathematically described and what is equal in *P* and *K*. If the offshoots coming from the neighboring points do not reach the retina, the perceptual apparatus has no criterion by which to decide between

*P* and *K*. This is the reason for this "mistake"; we see one phenomenon instead of the other if the offshoots of *P* and *K* are given without the offshoots of the other points which are necessary for a complete determination of the real process.

To be sure, that does not yet solve the further question: why do we always see *P* if the offshoots of *P* or *K* are given alone? Why are offshoots which could have been produced by *K* as well as by *P* always interpreted as coming from *P*? If *P* and *K* are objectively equivalent, then it seems that we have to ascribe this tendency toward the *P* phenomenon to the perceptual apparatus; we may at last have found a fact which we cannot explain by an analysis of the structure of the objective environment. However, *P* and *K* are not equivalent and their relation to the mathematical determination, which is the only one given in the single point experiment, is not the same. The mathematical determination is an essential characteristic of *P*, it belongs to *P*'s real physical structure. In other words: these offshoots could have been caused by a great number of different thing movements and one can imagine any number of complicated machines which could carry a point in this pendulum movement. However, only one of these movements is unitary in itself and conditioned internally to a high degree, and that is *P*. Therefore, if only the mathematical determination of a movement is given, the offshoots will be interpreted as coming from that movement which belongs to these determinations in its unitary structure, and is correlated to them in an objectively physical though not in a psychological sense.

Three questions arose in the analysis of this experiment: (1) why are *P* and *K* two psychologically different realities; (2) why, with the single stimulus, is *P* always seen; and (3) why does the phenomenon change into *K* if the other stimuli are introduced? These three questions find answers if one investigates the structure of the perceived objects and the mediation. Any apparatus whose task it is to present an adequate picture of the environment would be misled in this case by the mediation, just as the human perceptual organ is.

## III

As is the case with many problems of the psychology of perception, the ambiguity of the single local stimulus is central in the analysis of this experiment. By investigating the physical processes one can distinguish between several cases of ambiguity. To the statement, "The meaning of a 'sensation' is determined by the whole in which it is placed," corresponds another statement which refers to the physical environment: "An offshoot can be caused by different core events, and usually only a manifold of offshoots is univocally coordinated to the core."

One can classify into two groups the cases in which the single offshoot is ambiguous: the offshoot can contain too much, or too little: too much, because it is also determined by other events, not merely by the perceived object; too little, because not all properties of the object are represented in it.

The constancies belong to the first group. The offshoot, for instance, a light ray, depends partly on the properties of the thing, partly on the illumination. The illumination disturbs the univocal correspondence between offshoot and thing. Things of the same color can have different offshoots, differently colored things can have similar offshoots. Within the offshoot manifold, things belonging to different illumination levels are referred to one level; things belonging to different coordinate systems are, as it were, referred to one system. Similarly, the arrangement of light rays may be the same whether they come from an object that is large and distant or from one that is small and near. The reconstruction of the correct levels is the task of the perceptual apparatus, which solves this task by considering other nonlocal data. The essential meaning of the constancies lies in this reconstruction which is required by the physical conditions of perception. Therefore the fact that the so-called perceptual constancies exist, is based on a feature of the environment—though this does not yet explain how these constancies are brought about in the human perceptual apparatus.

In other cases the offshoots are not univocal because they are coordinated only to a part aspect of the core. The light rays are correlated to the form and color of a thing but not to its possibilities of movement. As was said before, these possibilities depend on whether the piece of matter perceived is a unitary object by itself, or, if it is a part of a bigger thing, on the properties of that bigger thing. A piece of wood of a certain color and form does not have the same possibilities of movement if it is part of the handle of a hammer that it has if it is part of the leg of a table. Since the offshoots are taken to represent the complete object (the piece of wood with all its properties, even its possibilities of movement), but are coordinated univocally only to form and color, they are ambiguous. Two-dimensional figures belong to a special group among these cases, whether they are drawn on paper, projected on a wall, or produced in some other way. With them we find particularly often that the significance of a part is determined by the whole. This does not seem to be true for the objective physical thing, a fact which points in this case to a difference between the phenomenal appearance and the physical relationships. For it is obvious that the physical possibilities of a piece of paper covered with black ink will not be changed if the surrounding pieces are made black. It must be asked whether this difference between phenomenon and object is due to the peculiarities of the perceptual apparatus.

In this connection it is important to realize that these plane figures which are produced by ink and paper are treated by our perception as if they were pictures of objective things. If one accepts this point of view one can again explain many ambiguities by referring to the objective structural significances, especially by referring to the fact that form does not imply a univocal determination of the possibilities of a thing. One can then easily understand why the ambiguities are especially striking in these cases. Subjective differences are produced to which no macroscopic physical differences correspond. What is objectively identical imitates what is different.

As mentioned above, the perception of complicated movement is similar to the cases of the constancies. The concepts which have been discussed allow us to determine more exactly the relationships involved. We are dealing with combinations of movement; for instance, a point executes a physically real movement *X*, which may be a true pendulum movement. The whole process can occur on a body *y* with the movement *Y*. The offshoots of *X* are then not univocally coordinated to the movement *X*, they are rather a function of *X* and *Y*; they change if *Y* changes. This motion is, so to speak, the level, in the sense that illumination is a level; the motion *X* belongs to the thing, it is presented to us by the offshoots and corresponds to the object color. The factors *X* and *Y*, which are thrown together in the offshoots as comparable magnitudes, have to be separated by the perceptual apparatus and referred to the correct level.

Thus we see that in many cases the ambiguity of a single local stimulus originates in the physical structure of the environment.

## IV

Figure 2 represents in a schematic way the relation between the perceptual system and the environment.

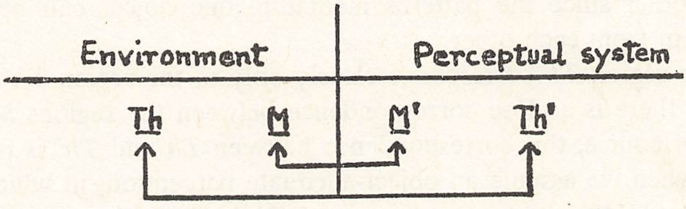

FIGURE 2

*Th*: The vitally relevant environment (we often call it "the world of things," but people, events, etc., also belong to it).

*M*: The mediating events, the stimuli which directly impinge on the organism.

*M'*: The processes in the organism correlated to the stimuli; they can be experienced under certain conditions, e.g., as reduction color.

*Th'*: Experiences which refer to things.

Ambiguity of the local stimulus means: to a certain segregated part of the region *M'* correspond different events in region *Th'*. This is still an inexact formulation. It would be better to say, in a more general way: the regions *MM'*, the regions of mediation, do not exactly correspond to the two regions *ThTh'* which are correlated to each other and which, so to speak, hold hands across the mediation region.

In order to get a better understanding of these relations, let us assume that we can order the entities of the mediating region *M* according to their similarities to each other. We would then obtain a manifold of points, and each point of this manifold would symbolize a certain stimulus pattern, e.g., a certain combination of light rays. Neighboring points would symbolize patterns which are similar to each other, and two points which are distant from each other would represent patterns which are very different from each other. The *Th* region could be ordered into a manifold in a similar way.

Let us now relate these two manifolds. Since one particular object can be mediated by a great number of different stimulus patterns, one point of the *Th* region has to be coordinated to many points of the *M* region. Further, these points in the *M* manifold are not located in one small connected region but are often far from each other since the patterns mediating one object can be very different from each other.

The region *Th* corresponds closely only to the region *Th′*; similarly, there is a close correspondence between the regions *M* and *M′*. Of course, this correspondence between *Th* and *Th′* is perfect only when we assume an object-adequate perception, in which the relation *M′-Th′* is a mirror image of *Th-M*. This does not always hold. When a melody is perceived, the object is not simply coordinated to the Gestalt character of the melody. Thus in this case there exists an incongruence between the systems which has nothing to do with the reference to the vitally relevant environment. Here we will not discuss the problem of the reality status of Gestalt characters. The objections which von Kries and Becher raised against an association theory of perception are based on the incongruence between the regions *Th* and *Th′* on the one hand and the regions *M* and *M′* on the other hand. Von Kries (1901) says: ". . . processes and patterns which are similar in a psychological sense, and which both lead to the same verbal symbol and are subsumed under the same general image, can be completely different" (p. 23). "One will always have to emphasize that two impressions which are similar according to their psychological effect have nothing in common if one considers them as a sum of stimuli arranged spatially in a certain way. The optical stimuli which a horse produces, one time seen from the front and from a small distance, another time from the side and from a greater distance, have nothing in common with what the designation 'horse' could be connected according to the association principle" (p. 25). Many examples demonstrating the same point can be found in Becher (1911), and in the literature of Gestalt psychology.

In general, the fact of mediation incongruence has been demonstrated, in a perhaps too one-sided way, only with figural and simple melodic forms. It certainly exists there, and may be especially impressive in these cases. But it must be emphasized that this mediation incongruence does not concern only figural perception. The same thing can "express" itself in many different stimulus patterns which are different from a figural point of view as well; and we can recognize it through these different mediations. This is shown, for instance, by von Kries's example of seeing a horse from the front and from the side.

Perhaps one can assume that there exist a number of different systems which connect the incongruent regions *M′* and *Th′*. The system of figural Gestalt units might be such an intermediate region. It is neither simply coordinated to the region of stimulus patterns, nor coordinated to the region of object meanings. Within the figural region there is no principle of identification according to which all figural structures representing the same meaning are included in one class.

This can be shown with the well-known illusion which consists of a picture of three men, drawn in equal size, walking away from the spectator down a hallway with perspective indicated by converging lines. The man who appears to be farthest away is seen as the tallest. True enough, the lines surrounding the men and the figural organization of these lines are the cause of this illusion. But it would be impossible to define the cause as something identifiable figurally. The basic reason for the illusion is the fact that the three men are, by means of the surrounding lines, put into different apparent distances, and that could have been achieved by many different line structures which have nothing in common figurally. Thus, if one considered only the figural region, one would make an error which could be called a skipping of meaning. One would be overlooking the fact that the effect from figure to figure does not occur within the figural region but in a region of meaning.

This example is analogous to that of the double-circle motion which was discussed before. There too the effect of the apparent motion of the surrounding points on the motion of one point does not occur in the figural region: the motion in the surrounding points refers, so to speak, the motion of a point to a different level of motion. Again, this level of motion is not identifiable figurally, but only as the "physical meaning of the motion."

Of course, one has to assume a certain correspondence between the regions *Th* and *M* in spite of this lack of simple congruence, because otherwise the region *M* could not serve as mediation. But this correspondence is not rigid and immediate; it is brought about by the intermediate systems.

To a certain extent, the *M* regions can be considered as irrelevant. The essential invariance in the perceptual process concerns the relation of the regions *Th* and *Th'*. The organism lives with and among things, and the specific mediation is to a large extent variable and allows substitution. If something new appears in the mediation, the processes will be reorganized in such a way that the coordination *Th-Th'* is re-established.

Since the essential process occurs between the regions *Th* and *Th'*, it does not seem quite adequate to consider only the processes connecting *M'* and *Th'*, and to try to find general laws concerning these processes. It is true that one may be able to show how a specific stimulus pattern gives rise to a specific meaning, but the factors which make possible a coordination between the regions *Th* and *Th'* seem to be more basic.

## V

Thus we see that the performance of the perceptual apparatus is to a great extent determined by the structure of the environment. The next question to be discussed is the following: we find many cases of veridical perception, i.e., cases in which the perceptual apparatus functions adequately. What role do these cases play in the investigation of perception? One could defend the position that the environment-adequate cases of perception are less apt to reveal the structure of the perceptual system than the cases of illusions or distortions.

In order to understand better the meaning of this possible answer to our question, we must try to determine more exactly this "dependence" of the perceptual system (*P*) on the environment (*E*). We shall begin by analyzing not the dependence of *P* on *E*, but simpler examples in which one system is, so to speak, the "leader" and another system is the "follower." These examples may show us some general features of this relation of dependence. We want to find lawful relationships which would hold in every case of such a coupling of systems. These relations can also be studied in simple physical examples. We need not be afraid of "physicalism." We shall use some concepts which have been employed in Chapter 1. It will be noted that we are not beginning with an analysis of the object of our investigation itself—the perceptual system—but with an analysis "from the outside." We use this procedure not because we think it is the only correct one, but because there are cases in which the method of beginning "from the outside" may be fruitful.

The following physical example may serve to present the relevant concepts. An iron ball is placed on a horizontal surface, and is fastened by a thread to a point of the surface. A magnet moves around above the ball. The magnet is the "leading" system, the fastened ball is the "following" system. The magnet system will be called *X*, the ball system *Y*. In Figure 3 the path of the magnet is

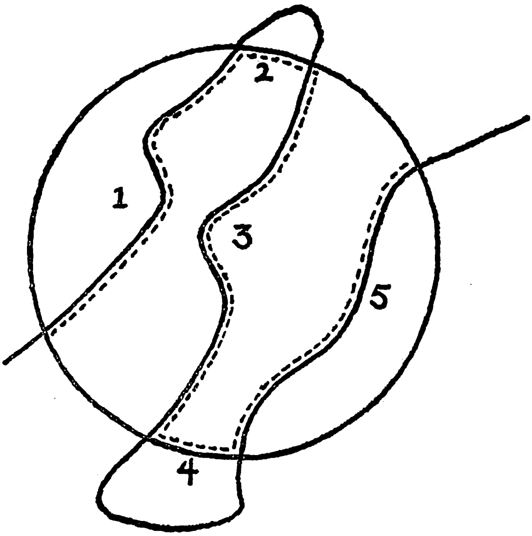

FIGURE 3

shown by a continuous line, the path of the ball by a dotted line. The parts of the path of the ball are not equal in meaning. In some parts (*1, 3, 5*) the ball follows the magnet. In other parts (*2, 4*) the form of the path of the ball is determined by the ball system itself, that is, in those parts in which the ball, held by the taut thread, cannot completely follow the magnet. Thus in some parts of the path the form has its source in *Y* (ball system) itself, in others the source of the form lies in *X* (magnet system).

The concept of the source of an event is important. A process can belong to a system *Y* but be centered, or have its source, in system *X*. This is possible if system *Y* has a great range of possibilities, while *X* determines which one of these possibilities will be actualized in a concrete case. Then the order in which the different actualizations follow each other has its source in *X*. Related to the concept of source is the concept of being internally or externally conditioned. In so far as an event has its source in the system to which it belongs, it is an internally conditioned event. It is externally conditioned if belonging and source are separated. Thus the form of the pieces *1, 3,* and *5,* which has its source in *X,* is externally conditioned. If we designate belonging by a capital letter, and source by a small letter, then *Yy* refers to something that is internally conditioned, *Yx* to something that is externally conditioned within system *Y*. The parts *1, 3,* and *5* belong to *Yx,* the parts *2* and *4* to *Yy*.

If we consider the structure of such a system coupling in its relevance to epistemology, we have to start, so to speak, from the other end, since cognition always follows a direction that is opposed to the direction of actual causation. It gropes forward from the effect to the underlying causes, from what is last to what is first. Everything can give information about its source, but not necessarily about that to which it belongs. Not everything in *Y* is helpful for the cognition of *Y*. Only what is coordinated to its inner conditions is helpful, i.e., only *Yy*. From the parts *1, 3,* and *5* one can infer only that the ball has the possibility of moving in such a way. The special sequence of ball positions contains nothing that is peculiar to *Y*. However, these parts give information about the system *X,* since they copy the path of the magnet. In so far as *Y* contains a *Yx* it is a medium and one can cognize *X* through *Y*.

The properties of *Y,* on the other hand, can only be found out from *Yy*. In other words: if one wants to cognize the properties of *Y* from a process in *Y,* then one has to exclude everything which agrees with *X,* disregard the features which can be resolved or explained by reference to *X*. Only those parts in which *Y* does not completely follow *X,* in which it makes "mistakes" in copying *X,* only those parts can serve to give information about *Y*. This thesis, which concerns the cognition of the system *Y*, is of special importance for the considerations that are to follow.

Let us consider a tuning fork which is struck in a certain rhythm with a stick. The stick—and, of course, what guides the stick—is the leading system in this coupling, the tuning fork the following system. Again, we can separate two features in the process going on in the tuning fork. The wave frequency is proper to the tuning fork, but the rhythm of successive sounds is externally conditioned and is not characteristic of the system; it is forced on the system. If we apply the letters again, we can call the stick *X*, the tuning fork *Y*, the frequency *Yy*, and the rhythm *Yx*. If one wants to find out the properties of *Y*, one again must rely on *Yy*. One must subtract from the whole event the *Yx* which belongs to *Y* but copies *X*. Those features which cannot be understood as a copy of the leading system have to have their source in *Y* itself. One could also say: the more an object is a medium—i.e., the more the *Yx* predominates—the less can one find out about it from its actual state. One cannot get much information about a transparent pane of glass as long as one lets it act as a medium. One can look through it as if it were clear air. Only if one touches it with one's hand—that is, only when it does not simply mediate what comes from the outside but rather acts as an internally conditioned object—can one get information about the pane itself. This is also the case when it is possible to see its edge, or when one sees it from the side and notices a thin glittering line. In all these cases it does not act as a pure medium. The space which lies between us and the objects could be filled with many objects; it would be impossible for us to cognize them from optical data if they always were pure media for light rays. One could say, this part of space has the property of being a medium, and that is all one could say about it.

Thus, if one knows a feature of a system *Y*—a system that is influenced by a system *X*—one has to consider this feature first in relation to *X* in order to find out whether it is a characteristic of *Y*. Where *Y* disagrees with *X*, there are the points of "inadequacy" (inadequacy in regard to copying *X*) which are characteristic for *Y*. One must not refer these features to system *X*, but rather they must be ordered in a way which corresponds to the properties of *Y*. The taking into account of *X* has only the purpose of avoiding a wrong conceptual centering.

This danger of a wrong centering and wrong unit formation is especially great where we are confronted with an enduring coupling of two systems. One is then easily induced to ascribe properties to *Y* which in reality are forced upon *Y* by *X*. Through constant coupling, features and units which are foreign to a system acquire the appearance of features proper to it. The wrong application of achievement concepts is a case of this kind of unit formation, which is foreign to the system one wants to describe.

Now we can attempt to treat the relation between *E* (environment) and *P* (perceptual system) in terms of the discussed concepts. *E* is the leading system, it is a case of *X*; *P* follows, it is a case of *Y*. The events in *P* have their source partly in *P* itself, partly in *E*. One can separate *Pp* from *Pe*. *Pe* is not symptomatic of *P*, it contains features which are foreign to *P*. In other words: *E* is mirrored in *P*. Where the mirror copies *E* exactly, it does not give information about *P* itself; only where the mirror distorts *E* can one get information about properties of *P* from the mirror image. This means that only when our perception is mistaken, only when it does not correctly reproduce the objects, can one obtain useful data for the study of the properties inherent in the perceptual system.

We have discussed the thought model which is characterized by the concepts of "leading" and "following" systems, "*X*-determined" and "*Y*-determined" features in *Y*, with two examples; this approach has been used to gain a better understanding of the relation of the environment to the perceptual system. Now we ought to consider whether the relation of *E* to *P* is actually analogous to the couplings which we found in the physical examples. We are especially concerned with *Yx*, those features of the system *Y* which have their source in *X*. In the physical examples it is simply *X*-adequate; it consists of the properties of *Y* which agree with *X*. They agree because in direct causation *X* induces the *Yx* in *Y*.

However, obviously the *E*-adequate features of *P* are not induced through a direct influence of *E*. This is indicated by general considerations which can be summarized as follows: object-adequate percepts are not directly enforced on *P* by *E*. Stimulus adequacy is not environment adequacy, and the more the receiving system elaborates and organizes the direct influences from the environment (i.e., the stimulus patterns, the raw data), the more it approaches the environment, and the more it offers an adequate picture of *E*. This can be demonstrated with every simple perception. If a tree is perceived, what is adequate to the tree does not consist of what is enforced on the retina by the stimuli but rather of what *P* makes out of these stimuli according to its own structure. Precisely the way in which *P* modifies and elaborates what is directly forced upon it proves to be very object-adequate. In other words, the *P* system functions purposefully. Therefore, with *P*, we have to distinguish between (1) what is forced on *P* by *E* directly, and (2) what is *E*-adequate in *P*.

As long as we consider only the regions *M* and *M′* (the region of stimuli and the region of "sensations"), we can maintain with a certain justification—though strictly speaking, it does not even hold there—that everything in *P* which is adequate to *E* (in this case to the stimuli) is forced on *P* by the direct influence of *E*. We still can use the analogy with the physical examples. But it is different with the regions *Th* and *Th′*, between which the two adjacent regions *M* and *M′* lie. Region *Th*, the objects, is the leading system; it is followed by region *Th′*, the region of percepts; these give a picture of *Th* and are more central psychical structures. Thus one finds *E*-adequacy in region *Th′*, but one cannot talk about direct enforcing.

One could also say that one finds adequacy of two different kinds. The one concerns only actual processes which belong to *M′* and which are enforced on *M′* by *M*. The other kind concerns dispositional characters and refers to the functions of *P* which connect *M′* with *Th′*. As we saw previously, these functions must to some degree correspond, like a mirror image, to the relation *Th*-*M*.

In the physical examples, there exists in *Y* an *X*-adequacy only as long as *X* influences *Y* directly; when *X* is absent, there is no *Yx*. With *P* it is different. *E*-adequacy lies in the structure and in the functions of *P*. This adequacy is also present when *E* does not influence *P*. It is something dispositional and it concerns the possibilities and properties of *P*.

This is a fundamentally new relation. It represents a higher level of adequacy. Instead of adequate actual processes it consists of adequate dispositions and functions. Dispositions of a system, which are adequate to something foreign to this system, are doubly centered; they seemingly have their home both inside and outside of the system. With these considerations we have found an approach to the concept of "purpose." A function is called purposeful if it can be meaningfully referred to two different systems—or, if we want to use a more cautious formulation, to two systems which at first sight seem to be separate. It is not contended that the essence of purposefulness consists of this property, only that it shows this feature when it is analyzed "from the outside." However, our thinking revolts against attributing such a double home to any part of reality. We cannot conceive of correlations which hang in the air, so to speak. We try to derive the separate but nevertheless corresponding facts from a unitary source.[1] This can be done in two ways: (1) One can assume that both facts have their source in one of the systems. In doing this, one is also assuming, along with this dispositional correspondence, a forcing upon, a leading and a following system. (2) One can assume that the corresponding facts have a common source outside the two systems. It may be mentioned that association theory and related theories make use of the first possibility. We can conceive of these theories as attempts to explain the correspondence by the assumption that one system forces dispositions upon another system.

But here we want only to consider some methodological questions, primarily whether, taking into account dispositional correspondence, we can still maintain the thesis stated above: i.e., that only inadequate perception reveals the properties of the perceptual system. One could contend that this proposition is also justified in regard to functions. As long as a function is adequate in reference to something foreign to the system, it tells us only just this fact, namely, that it follows the other system. But how this adequacy is brought about, and on which more fundamental possibilities it is based, one can find out only by observing inadequacies.

Thus the method of studying the properties of the perceptual system can be characterized as follows (and this method is probably valid in all similar cases of system coupling): the features which are adequate to the environment must be determined first, and then facts must be referred to an immanent order, which is made possible by taking into account the inadequate features.

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[1] See Bühler (1929, p. 148ff.). The theory of system coupling is of great importance for many philosophical and scientific problems. The correspondence of two seemingly independent systems appears to man as a problem and points to some underlying causes (e.g., the body-soul problem).

## 3

# THE FUNCTION OF ECONOMICAL DESCRIPTION IN PERCEPTION

The purpose of this paper is (1) to relate some of the ideas expressed in the paper on "Thing and Medium" to Russell's theory of the role of causal lines in perception, and (2) to discuss the function of economical description in veridical perception.

The starting point of "Thing and Medium" was the puzzle which arises when one considers the causal antecedents of the stimuli impinging on the organism. Let us take the case of a visual perception of a distant object. Tracing the process back from the proximal stimulus we find the following stages: (1) light waves between the organism and the object, (2) an event involving the object, (3) light waves between the object and the light source, and (4) a process in the light source.

If one says that the percept is directed toward the object because the object causes the proximal stimulus, the following question must be posed: why is the object the target of perception and not any of the other stages which are all causal antecedents of the proximal stimulus? (Cf. Meinong [1906, p. 107]; the section dealing with this question in "Thing and Medium" has been omitted.)

Russell says in discussing this problem: "In the daytime, practically all the light that reaches the eye comes ultimately from the sun, but we do not say that we are seeing only the sun. We are seeing the last region after which the course of light was virtually unimpeded until it reached the eye. When light is reflected or scattered, we consider, as a rule, that it makes us see the last object from which it is reflected or scattered . . ." (Russell, 1948, p. 207).

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This essay has been especially written for this volume and has not been published before.

Thus the fact that the distal stimulus "causes" the proximal stimulus cannot be the only basis for the possibility of our seeing objects. In order to solve the problem of why we do not say that we see the source of light when we look at illuminated objects, one has to consider the relation of the light process to the different systems ("substrata") through which it passes. Some of these systems show a high degree of restraint, their parts are mutually dependent, and they impose their order on the process. These systems are, by and large, the vitally relevant things of our environment, the distal stimuli. Opposed to them are systems which show a low degree of restraint; their parts are mutually independent, and they take on any order imposed on them. These systems can serve as mediators. When proximal stimuli impinge on our sense organs, we say we perceive the things of the environment, that is, the systems which imposed their order on the mediation and through the mediation on the perceptors. We do not say we perceive the source of illumination because it is not responsible for the order contained in the proximal stimuli.

Russell, who as we saw is concerned with similar questions, says: "When I see a table or a chair or a page of print there are causal lines from its parts to the eye. We can carry the chain of causation further back, until we reach the sun—if we are seeing by daylight. But when we go further back than the table or chair or page of print, the causes have no longer any close resemblance to their effects. . . . Consequently, the experience that I have when I 'see a table' can give me much knowledge concerning the table, but not much knowledge concerning earlier parts of the process that ends in my experience. For this reason I am said to be seeing the table, not the sun" (Russell, 1948, p. 459). By "causal line" he does not mean a line connecting any cause and effect, but a line which preserves variety: "A 'causal line,' as I wish to define the term, is a temporal series of events so related that, given some of them, something can be inferred about the others whatever may be happening elsewhere" (p. 459). He also refers to the mutual independence of mediating events: "If percepts are to allow inferences to objects, the physical world must contain more or less separable causal chains. . . . The theory of light assures us that this is the case. Light waves emanating from a source will, in suitable circumstances, pursue their course practically unaffected by other light waves in the same region" (p. 206).

An imposed order can therefore function as a sign for the imposing order; it cannot be explained in terms of the system which contains it because this system has few restraints and any order arising in it would be highly improbable. In "Thing and Medium" these imposed orders are called "spurious units"; they make cognition in depth possible; they are responsible for the fact that our world extends beyond what touches our skins. They are the manifolds of "offshoots" from which we infer the core systems and core events.

When a manifold of offshoots is interpreted as coming from one causal center, and if this manifold is thus taken as a sign of the causal center, the interpretation is "economical." It seems worth while to spell out in greater detail the relation between economical interpretation on the one hand, and the probability of the connection linking offshoot and center on the other hand.

Let us think again of the schematic representation of the total perceptual event (see "The Function of the Perceptual System"). It contains two parts: the environmental part, extending from object to proximal stimulus, and the part extending from proximal stimulus to phenomenon. Brunswik (1955b, p. 9) called them the ecological and the organismic phase.

The first part is characterized by the relation between causal center and offshoot manifold. One specific offshoot manifold x could have been caused by a great number of causal centers $c_1$, $c_2$, . . . $c_n$, though with unequal probabilities. That is, the probability that x has been caused by $c_1$ may be .001, by $c_2$ .003, and so on, but that it has been caused by a certain $c_3$ is .99. We find one c with a probability very much higher than that of any other c, if we disregard the possibility of an ambiguous x. These probabilities we could obtain by a frequency count of actual coordinations between x and the different centers. They are given by the structure of the environment and are independent of the perceptual system.

Now let us consider the organismic part of the perceptual event. It is ruled by the law of *Prägnanz,* which has recently been reformulated as the law of economical description. A certain pattern of stimuli is linked to a number of theoretically possible phenomena or "interpretations." The one that usually occurs is distinguished by being an economical description. Thus, Hochberg and McAlister (1953) suggest the hypothesis that "the probability of a given response to a stimulus is an inverse function of the amount of information required to define that pattern" (p. 364). Using a slightly different approach, Attneave (1954) says: "It appears likely that a major function of the perceptual machinery is to strip away some of the redundancy of stimulation, to describe or encode incoming information in a form more economical than that in which it impinges on the receptors" (p. 189).

Thus the offshoot manifold, the x, is coordinated on the environmental side to the most probable cause, and on the organismic side to a response which is economical of information. How is it possible that by "stripping away the redundancy of stimulation" a representation of the object that caused the stimulation is obtained? Why does the law of economical description furnish a general rule for the decoding of the stimulus pattern?

Russell says that "when a group of complex events in more or less the same neighborhood all have a common structure, and appear to be grouped about a central event, it is probable that they have a common causal ancestor" (Russell, 1948, pp. 464-465). In this formulation he has in mind especially cases like that of one object seen from different points of view. The proximal stimulus patterns are approximately identical and they are all referred to the same causal center.

The first part of the quoted sentence implies the possibility of economical description. When several complex events have a common structure, they can be described economically "by describing one and specifying the positions of the others and the fact that they are identical (cf. *similarity* as a grouping law)" (Attneave, 1954, p. 190). Though Attneave refers to somewhat different examples, his statement is relevant here.

The second part of the sentence refers to the probability of the common causal ancestor, and Russell says that he is using the word "probable" in the sense of frequency. He suggests that there exists an underlying law of nature which he formulates as follows: "Any complex event tends to be followed by other complex events identical, or approximately identical, with it in structure, and distributing themselves from next to next throughout a certain region of space-time" (Russell, 1948, p. 467).

Thus we see that possibility of economical description (in this case similarity) and probability of the common causal ancestor are considered as belonging together. Essentially the same idea is expressed in "Thing and Medium" by the concept of "spurious unit," by which is meant a regularity which points to a "unitary cause," that is, to a common causal ancestor. In regard to forced vibration, which is taken as an example of a manifold produced by a common source, it is said that "if each beat had an independent cause, it would be very improbable that the beats would show this kind of regularity" (see p. 6).

The role of probability and parsimony in perception were considered by Ernst Mach (1897). He took as an example the case of a straight line. He says that, on the one hand, it is an instance of economy of description which he formulates in the following way: "Thus the straight line in space represents a minimum of departure from the mean of the depth-sensations; and the assumption forthwith presents itself that the straight line is seen with the least effort" (p. 96). This formulation is similar to that of Attneave (1954, p. 191).

It may be mentioned that in Mach's theory the "deviation of a sensation from the mean of the neighboring sensations" plays an important role. We are reminded of Helson's theory of adaptation level and of Attneave's discussion of it (1954, p. 191). Mach says that "The deviation of a sensation from the mean of the adjacent sensations is always noticeable, and exacts a special effort on the part of the sense-organ" (1897, p. 97). He applies this idea also to light "sensations."

To return to the straight line: it also illustrates Mach's "principle of probability," in that "The most probable object . . . answering to a perspective straight line, is a spatial straight line" (Mach, 1897, p. 95). What is meant is that a straight line in the environment, for instance, the edge of a table, will always produce a straight line in the perspective plane in whatever position it lies, except when it is directed toward the receptor and its projection is a point. A straight line in the perspective plane could also have been produced by a curved line in space, but only by one lying in a plane in which also the receptor lies. Therefore, it is much more probable that the perspective straight line is produced by a straight line than by a curve in space. "The visual sense acts therefore in conformity with the principle of economy, and, at the same time, in conformity with the principle of probability, when it exhibits a preference for straight lines" (Mach, 1897, p. 96).

Obviously, Mach here introduces something like the principle of inverse probabilities. In this connection it is interesting to see how Laplace (1814) states the "fundamental principle . . . which consists in passing from events to causes." He says: "Each of the causes to which an observed event may be attributed is indicated with just as much likelihood as there is probability that the event will take place, supposing the event to be constant. The probability of the existence of any one of these causes is then a fraction whose numerator is the probability of the event resulting from this cause and whose denominator is the sum of the similar probabilities relative to all causes; if these various causes, considered *a priori,* are unequally probable, it is necessary, in place of the probability of the event resulting from each cause, to employ the product of this probability by the possibility of the cause itself" (p. 1331). Laplace states that this principle expresses the reason why we attribute regular events to a particular cause: "If we seek a cause wherever we perceive symmetry, it is not that we regard a symmetrical event as less possible than others, but, since this event ought to be the effect of a regular cause or that of chance, the first of these suppositions is more probable than the second" (p. 1331). These considerations certainly seem highly relevant to our problem. Again we find a connection stated between the possibility of economical description (symmetry), and attribution to a causal center.

As a last example we take the attribution of relative motion, which has been studied by Duncker (1929) and Johansson (1950). Hochberg (1957) summarizes Johansson's findings as follows: "In Johansson's motion studies, those components in a complex moving stimulus which are common to all members of a group are 'partialled out' and form a single framework in relation to which the residual motions appear" (p. 82). He adds that "such unification achieves an 'informational' economy since, for any given stimulus, the perception entailing the least number of changes is obtained" (p. 82). It is illuminating to compare with this formulation of the relation between the proximal stimulus and phenomenon another treatment of essentially the same case, which is, however, more interested in the relation between proximal stimulus and the actual environmental changes, that is, in the ecological phase. Cournot (1838) states that if we observe a manifold of points and notice that all points except one had preserved their relative position, "we should consider it very probable that this single point was the only one which had moved, unless, indeed, all the other points were so connected that the movement of one would involve the movement of all" (p. 1204). He uses this principle to obtain the most probable hypothesis regarding the attribution of relative changes of values of commodities, and he comes to the conclusion that "among all the possible hypotheses on absolute variations some explain the relative variations more simply and more probably than others" (p. 1205). Thus simplicity of organization and probability of reconstructing the actual environmental process are again coupled.

These quotations, taken from different sources, do not yet give us a formal and exact description of the relations between economy and probability in perception. However, they seem to indicate that in using the principle of economy of description our perceptual apparatus succeeds in decoding the stimulus pattern in an adaptive and realistic way. A causal center is responsible for a number of offshoots spreading out in different directions. When this offshoot manifold is defined with reference to the center, then, in most cases, it is defined more economically than without this reference.

However, we must ask whether it is really necessary to assume that the perceptual apparatus "uses" the principle of economy as a general method of decoding the stimulus input. Here we can apply the considerations which were presented in "The Function of the Perceptual System." One point that was made there was that not everything that happens in a system has to be ascribed to the restraints of this system.

The very fact that the principle of economy is adapted, that is, that it implies a correspondence with the environment, is a reason to be cautious in believing that it is embodied in the functioning of the perceptual system. So far we have found out only that the principle of economy leads to results that conform to the environment, and that we can describe the "outputs" of the perceptual apparatus as if they followed that principle. But we have thus only described the achievements, the end results of the perceptual system; we do not know how they are attained. Maybe they are attained without the help of this principle by a sort of rote memorizing of all the different cases of offshoot-center connections.

For example, a person may know how to write down the correct answers to a number of puzzle questions, and an observer could describe the answers as being in accord with a general method of solution. But that does not prove that this general method was used in obtaining the answers; they may have been learned by heart. Again, one might be able to produce a machine which gives the response "cube" to a limited number of perspective views of an actual cube, and which similarly gives correct responses to views of a pyramid or a cone. The responses could be described as following the principle of economy of description of the stimulus pattern, though they are actually the result of specific connections and the principle of economy has played no part in the functioning of the machine.

Fortunately, we have ample evidence about the role of the principle of economy in perception. The percepts which can be described in terms of this principle are not all adapted, they do not all point to the true causal center. They are often "errors" of the perceptual system. To use the analogue of the person who "solves" puzzles: as long as he gives answers which are correct solutions, we do not know whether he has just memorized the solutions or whether he produced them with an understanding of the operations involved. But if he makes an error, and we are able to trace this error to the wrong application of a principle, we can conclude that this principle plays a role in his thinking. In the same way, we do not know whether we are justified in attributing the principle of economy to the perceptual apparatus as long as it leads to veridical perception. But since it often leads to nonveridical perception, we can assume that it is a characteristic of the perceptual processes.

## 4

# ENVIRONMENTAL DETERMINANTS IN PSYCHOLOGICAL THEORIES

Numerous attempts have been made to bring about discussions in which the basic concepts of different psychological theories can be brought into relation with each other. But such attempts have usually failed to yield fruitful results, and they have failed largely because the basic terms in which the data are organized by the different theories are not fully analyzed and because discussion is often based on concepts that are not directly comparable. In order to bring together the different theoretical approaches to psychological problems and to discuss them, we must recognize that it is often possible, especially in sciences dealing with the organism, to organize data in several different ways, at least in a first approximation. The way in which data are organized and the method by which the identity of focal unities or focal variables is determined are significant characteristics of a theory. Until we understand clearly what a given theory considers essential for the description of phenomena and in what terms it describes a given process in order to connect it with what has preceded and to predict its future, we cannot try to bring that theory into relation with others.

The purpose of this paper is to consider some general problems of determination and of the derivation of subordinate systems. The distinction between proximal and distal determinants is treated in detail and an attempt is made to analyze several psychological theories in terms of this distinction.

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Originally published in *Psychological Review,* 46:383-410, 1939.

## GENERAL REMARKS ABOUT DETERMINATION OF FOCAL VARIABLES

### *Relevant Determination*

In order to discuss the determination of focal variables we can do no better than to begin with a quotation from Holt (1915):

> . . . It is inaccurate to say that a river flows toward the sea . . . while it is fairly accurate to describe it as always flowing towards the next lower level of the earth's surface, and this is a law describing flow as a constant function of the earth's crust and the position of the earth's center. The test is, of course, whether this or that could be removed *without changing* the river's course. . . . So in behavior, the flock of birds is not, with any accuracy, flying over the green field; it is, more essentially, flying southward; . . . the sole question which we need ever ask is, "What is it doing?" [p. 166].

Or again:

> . . . the man is walking past my window; no, I am wrong, it is not past my window that he is walking; it is *to* the theater; . . . the functional view . . . admonishes us to keep the man whole (if it is *behavior* that we are studying) and to study his movements until we have discovered *exactly what* he is doing, that is, until we have found that object, situation, process . . . of which his behavior is a *constant function* [p. 161f.].

Koffka (1935), in explaining the meaning of relevant and irrelevant description, uses almost the same example:

> . . . a ball runs down an incline and finally falls into a hole. Now there may be water in the hole or not, and therefore I can say the ball falls into a hole with water or without water. But this difference does not affect the motions of the ball until it has reached that position in space where the water begins in the one case and not in the other. For the rest of the motion the presence or absence of water is wholly irrelevant; similarly, the statement that the rat does not run towards food when the experimenter has just removed it, is quite irrelevant to the run of the rat until it is near enough to notice the absence of food [p. 37].

Of course the inquiry, "What are the objects doing?" is not so simple as Holt makes it out. Each theory uses a different set of concepts as the only valid and legitimate one. But we learn from these quotations, first, that there exist a great number—as a matter of fact an infinite number—of possibilities of determining an event. We can determine the motion of the water in a river as toward the sea or toward the next lower level of the earth's surface; we can describe the motion of a flock of birds as "over the green field," or as "southward." Besides the determinants mentioned in the quotations, a great number of other determinants are possible.

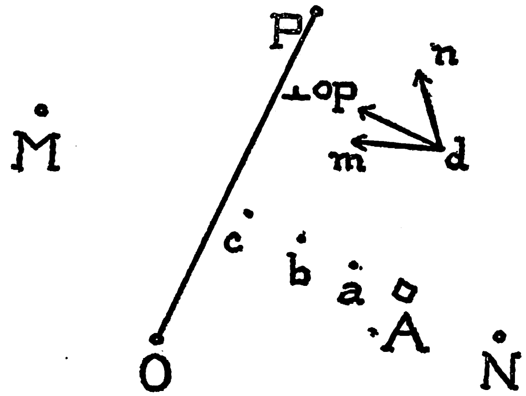

FIGURE 1

Secondly we learn that only a few determinants are relevant; i.e., there are only a few determinants that can be used to describe the events in a simple way. The test for this relevancy consists in finding constant functions. We may add another example which demonstrates the same facts in a more abstract way. Let us assume that one can observe that particle *A* in Figure 1 moves through points *a, b, c.* We are free to determine this motion in many different ways. We can say *A* is moving toward *M,* or away from *N,* or that it is moving toward the line *OP* in a direction perpendicular to it. Which determination is relevant? That is to say, what is *A* "really" doing? We find the answer if we remove *A* to point *d.* If *A* then moves in direction *m,* it is moving toward *M.* If it moves in direction *n,* it is moving away from *N,* and so on.[1]

### *Rival Determinants*

However, the task of determining the variables in a relevant way is not always so simple. It is often made difficult by the possibility of rival determinants. Usually only one determinant will be successful, that is to say, will make a simple description of events possible and will yield constant coordinations for different situations. However, it often happens that determinants which belong to different regions seem to yield constant functions. Wherever we find two or more contending theories there exists such a situation. Examples are: description in terms of the whole or in terms of the parts (gas vs. molecule, group vs. individual, body vs. cell); in terms of "higher" or "lower" levels ("explaining" and "understanding" psychology, physics-physiology-biology-psychology). In all of these cases one and the same phenomenon can be described more or less relevantly by using concepts belonging to different focal regions.

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[1] In regard to methods for finding relevant determinations, see the important studies of Heinrich Klüver (1933, 1936).

The fact of multiple focus furnishes philosophy with many of its classical problems. Multiple focus is distasteful to thinking; it blocks the tendency toward unified determination. It is as if it were possible to read one and the same book in two ways; once by organizing the letter configurations into English sentences, and then again by organizing them into German sentences.

### *Types of Derivation of Subordinate Systems of Determinants*

In order to escape the dilemma of rival determinants different devices are used. Thus many theories say: "Yes, it is true that one can find more or less constant functions if one chooses the terms of region *B*. However, using these determinants, one will never attain a complete description of the cases in question. The seemingly constant functions one finds in this way are the product of a combination of functions which can only be determined adequately if one applies the terms of region *A*." The derivation of subordinate systems of functions becomes, therefore, a main problem for many theories.

This derivation follows certain patterns. A typical kind of derivation is, for instance, derivation by selection. Let us assume that a given manifold of processes or objects can be determined more or less relevantly in terms of two different regions, *A* and *B*. This is a case of multiple focus. Let us now assume that one theory, in order to reduce this multiple focus to single focus, declares *A* to be the focus, the independent system, and *B* to be the derived system.

The theory contends, then, that originally there were an infinite number of processes or objects, and they were all relevantly determinable in system *A*. The fact that we find a few processes which show constancy when determined in system *B* is due to chance. If there is an infinite number of items available we can arbitrarily choose any determinants and we shall always find a certain number of items which show constant functions in regard to those determinants. Furthermore, the theory contends that there is a selection going on which works in such a way that in the end only items conforming to system *B* are left over, and all items not conforming to *B* are eradicated. Since all items conform to *A*, the items which are left over conform to both *A* and *B*. It is assumed that the selection itself can also be explained in terms of system *A* alone. Thus it can be shown that only determination in system *A* is inherently relevant. Determination in *B* is not independently relevant; it is an outgrowth of determination in *A*.

Darwin's theory of selection uses this method in establishing the system of teleological determination as a dependent system. An infinite number of possibilities is realized, all conforming to system *A*, which is in this case the system of causal explanation. Some of them possess characteristics which "make sense" in system *B* also; that is to say, they can be determined as having some use for the organism. Natural selection then works in such a way that only these possibilities are left over.

Other cases of derivation by selection are offered by the theories which explain the teleological properties of perception or thinking, namely the fact that in some way they show a correspondence to the "real" world, in terms of experience. The problem is very similar: double determination, that is to say, determination in causal and in teleological terms, has to be reduced to single determination in causal terms. An infinite number of possible bonds is realized, all conforming to causal system *A*. Some of them also fit the teleological system *B*, and a law of effect, for instance, takes care of the selection. Theories of association, of conditioned reflex, positivistic and pragmatistic theories of the derivation of logical forms, all make use of this type of derivation.

Often the defenders of system *B* use counterarguments, which again follow typical patterns. They can say, first, that the assumption of an originally infinite number of possibilities is untenable. In observation we find only a small number of items $A\bar{B}$ (conforming to *A* but not to *B*); most of the items are *AB*. It cannot be due to chance, therefore, that *B*'s appear.

Or they can say that the *B*'s are of such great complexity that the probability of *B*'s coming into existence among the *A*'s through chance is infinitely small.

Or they can say that there exist *B*'s in regions where the process by which *B*'s were selected from the infinite number of *A*'s never occurred.

To this last argument the defenders of *A* can retort by using the device of extrapolation. They assume that selection worked so often on items conforming to system *A* that these items, in time, got used to conforming to *B* and so exhibit *B*-characteristics even in regions where the selection was not directly active.

### *Tendencies Affecting the Selection of Determinants*

One might assume that the question as to which region shall be used as the primary system of determination is always answered on the basis of empirical findings. However, this assumption does not always seem to hold. General *a priori* tendencies are often responsible for the choice of a certain region as a focus. A few of these tendencies may be enumerated.

*1.* A tendency to use regions close to the observer as the focal region.—This tendency results from a reluctance to make theories and from an inclination to measure prematurely. Surface processes or surface characteristics are taken as relevant determinants and correlations are computed. Both the psychology of personality and of social functions provide many examples. This tendency is supported by positivism. The important principle which states that every concept should be anchored in observations or "operations" is often misunderstood. It is thought that one should take the directly observed entities themselves as the focus and that one should be satisfied with a language of data. Cruder forms of behaviorism thus find an ally in a misunderstood positivism.[2]

*2.* A tendency to use the same focus for different regions of a science.—One does not want the science to be broken up into regions with different determinants. There will always be attempts to find constancies of a higher order and to put the focus into a deeper layer so as to combine the different regions.

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[2] See Koffka's concepts of achievement and performance (1935, p. 530), and Lewin's confrontation of historic-geographic and systematic concepts, phenotypic and genotypic language (1935).

*3.* A tendency to use proximal determinants and to avoid distant determinants.—No change should be determined by something which is distant in time or space. More will be said about this point later.

### *Psychological Fallacies*

In determining the focus of a psychological theory one must always keep in mind the possibility of a disguised focus. The relevant variables may be assumed to be in region *A;* however, since there often exists a confusion between regions, or an unwarranted assumption of equality of regions, the relevant variables are really described in terms of another region *B*. By means of a disguised focus sham solutions of many problems are possible. This fact has often been noticed, and it has been discussed in a more general way under the name of "fallacy" or "error."

Some of these confusions (see Table I) are:

*1.* James' "psychologist's fallacy."—The "mental state" is determined in terms of the coordinated object. "Equal to" is substituted for "referring to."

> The *great* snare of the psychologist is the *confusion of his own standpoint with that of the mental fact* about which he is making his report. I shall hereafter call this the "psychologist's fallacy" *par excellence*. . . . Now when it is a cognitive state (percept, thought, concept, etc.), he ordinarily has no other way of naming it than as the thought, percept, etc., *of that object*. He himself, meanwhile, knowing the self-same object in *his* way, gets easily led to suppose that the thought, which is *of* it, knows it in the same way in which he knows it, although this is often very far from being the case [1890, Vol. I, p. 196].

TABLE I

SOME OF THE PSYCHOLOGICAL "FALLACIES"

The arrows start in the region the terms of which are supposedly used; they end in the region the terms of which are actually used.

| | images | sensations | stimuli | objects |
|---|---|---|---|---|
| James' fallacy | ——— | ——— | ——— | → |
| Stimulus error (Titchener) | | ——— | ——— | → |
| Constancy hypothesis | | ——— | → | |
| Experience error | | | ——— | → |

*2.* Titchener's stimulus error.—The psychological "elements" (sensations, etc.) are described in terms of the physical environment. "The psychologist commits the stimulus-error when he lapses from the psychological point of view into some other, like the physical" (Boring, 1929, p. 410).

*3.* Köhler's constancy hypothesis.—"Sensations" are hypothesized and described in terms of the stimuli (1929, p. 96).

*4.* Köhler's experience error.—Stimuli are described in terms of the experiential or distant object.

> In psychology much has been said about the stimulus-error which consists in our confusing our knowledge about the physical conditions of sensory experience with experience as such. But another mistake, which I propose to call the *experience-error,* is not less unfortunate. It occurs when we unintentionally attribute certain properties of sensory experience to the actual constellation of stimuli, properties which are so very common that we tend to apply them to whatever we are thinking about. This is the case primarily, wherever we have not yet learned to see the *problem* contained in those common properties of experience. No wonder, then, that neurologists and some psychologists still talk about "the retinal stimuli" corresponding to an object, as though there were something like detached functional units on the retina [Köhler, 1929, p. 176].
>
> Because the distant object is a thing by itself, the assumption is tacitly made that the retinal image corresponding to it is also [Koffka, 1935, p. 97].

## DISTAL AND PROXIMAL DETERMINANTS IN SEVERAL PSYCHOLOGICAL THEORIES

A consideration of relevant description and its relation to a manifold of regions is important for psychology because, as the discussion of the fallacies has shown, there are so many regions involved in each psychological process. And not only are there many regions involved, but determination in terms of each region seems to make sense; that is to say, leads to relatively constant functions. This makes for the multiplicity of psychological theories, each of which places the focal concepts in a different region.

In the following an attempt is made to describe a few psychological theories in regard to the place of focus. We shall, for the most part, consider only the outer field, that is to say, environmental determinants, and shall only occasionally refer to internal, inner-organismic determination.

Of prime importance for all theories is the question whether distal or proximal data are used as the focus in the determination. One can treat perception and action either in terms of the distant object (perception functions in such a way that the distant object is "attained"; the organism moves toward the food, etc.); or one can treat it in terms of proximal influences and effects, that is to say, in terms of processes close to the skin, stimuli, muscle contractions or movements of the limbs.[3]

### *Theories in Terms of Proximal Influences and Effects*

These theories fall into two groups. One group stresses perception; to it belong the older theories of perception which emphasized the stimulus-oriented sensations. The other group treats the psychological processes more from the point of view of action and motor phenomena; to it belong the stimulus-response theories.[4]

It is easy to see that these theories get their vitality from the general tendency to use proximal determinants and not from observation; observation favors distal determinants much more. The exponents of these theories want to relate psychological processes to the actual concrete influences which organism and environment exert on each other.

The most important arguments against these theories can be reduced to a single point: observation shows that often distal determination is possible where proximal determination is impossible. Von Kries, Becher, Ehrenfels, and the Gestalt theory used this argument against the older theories of perception; different teleological systems (McDougall, etc.) used this argument against stimulus-response theories.

Indeed, the most important problem for all theories using proximal determinants is to show that it is possible to establish that system of determination as the independent one, and further that it is possible to derive from that system the existence of relevant distal determinants, which are found in observation, and to treat them as only apparently relevant determinants. The device which is almost exclusively used for this derivation is selection. There is the infinite number of possibilities of bonds of association or conditioned reflexes between any stimuli and any responses. Contact with the environment establishes or strengthens only a limited, selected number of these bonds. Selection works in such a way that distal determination, that is to say, correspondence to the objects of the environment, is brought about.

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[3] See Koffka's use of the terms proximal and distant stimuli (1935, p. 80).

[4] That these two groups of theories belong together has been shown, for instance, by Köhler (1929).

However, very often the derivation of distal from proximal determination is effected by the surreptitious substitution of distal for proximal terms.[5] The following cases are examples of disguised focus. We quote here from a study in which distal determinants are quite openly introduced into a "stimulus-response" theory.

> Suppose that we are studying the behavior of such an organism as a rat in pressing a lever. The number of distinguishable acts on the part of the rat that will give the required movement of the lever is indefinite and very large. Except for certain rare cases they constitute a class, which is sufficiently well-defined by the phrase "pressing the lever." Now it may be shown that under various circumstances the rate of responding is significant—that is to say, it maintains itself or changes in lawful ways [Skinner, 1935, p. 44].

We note that the author starts out to study "the behavior of such an organism as a rat in pressing a lever," that is to say, a phenomenon which is from the beginning defined by distal determinants. It is conceded that it is impossible to find coordinated proximal events: "The number of distinguishable acts on the part of the rat that will give the required movement of the lever is indefinite and very large." Therefore, instead of proximal events, there is substituted a "class which is sufficiently well defined by the phrase 'pressing the lever,' " a phrase which of course denotes distal determination in its purest form. And, placing the focus in the distant environment, one can find that "the rate of responding is significant—that is to say, it maintains itself or changes in lawful ways," namely, distal determination yields constant functions.

That distal determination is forced upon us by the observed facts is also stressed in the following quotation:

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[5] See especially the keen analysis of stimulus-response theories by Arthur F. Bentley (1935).

> The uniformity of the change in rate excludes any supposition that we are dealing with a group of separate reflexes and forces the conclusion that "pressing the lever" behaves experimentally as a unitary thing [Skinner, 1935, p. 45].

We should like to add one more quotation from the same paper, in which the principle of finding the relevant determination is clearly expressed:

> It is then possible to test the irrelevance of a non-defining property by showing that two responses, one of which possesses the property, the other not, contribute equally well to a total number [of elicitations of a reflex] [1935, p. 44].

Not always is the change in focus as patent as in this paper. It is much more difficult, for instance, to find in Hull's theory of habit-family hierarchy the place where distal determinants are substituted for proximal determinants. The problem that this theory attempts to solve comes from the fact that "habits" which are determined distally, by the achievement, represent a confusing variety in proximal terms. "Instead of presenting a single unvarying and undistinguishable sameness, as is too often assumed, habits . . . present remarkably varied series of patterns" (Hull, 1934, p. 33).

According to Hull, some mechanism has to be found which gives identity to this "family" of patterns in terms of action sequences. The problem is essentially the same as that which von Kries stated for perception: Is there anything identical in the different stimulus patterns that correspond to an identical object? If the analogous problem were solved for action, it would be a decided advance toward an explanation of goal-directed behavior. "It [the principle of habit-family hierarchy] is operative in all situations wherever there is more than one distinct action sequence which will lead to the attainment of a particular goal or subgoal. It is believed, for example, that the habit-family hierarchy constitutes the dominant physical mechanism which mediates such tests of truth and error as organisms employ—that it provides the basis for a purely physical theory of knowledge" (Hull, 1934, p. 40f.).

We do not have to go into the details of this interesting and ingenious theory in order to show why we believe that it, too, achieves the solution by means of a disguised focus. The critical point is the definition of the identical element which makes the different action sequences belong to one family and thereby interchangeable. This identical element is the "same" goal reaction which is brought forward in the action sequence as the "fractional anticipatory goal reaction." "It thus seems probable that the fractional anticipatory goal reaction is the major mechanism which brings about the integration of the habit-family hierarchy" (Hull, 1934, p. 43).

The whole theory depends on the terms in which the goal reaction is defined. If it is possible to define it in real stimulus-response terms, that is to say, proximally, and without including environmental determinants, then the theory has solved its problem.

It seems, however, that the goal reaction is not defined in this way. This fact becomes especially clear if we examine the case of "purposeful" locomotion and orientation in space which Hull discusses in terms of this theory. Which determinants do we have to use in order to be able to say that goal reactions belonging to different action sequences (action sequences which correspond to different paths to the same goal in the environmental space) are all one and the same goal reaction? According to Hull, these goal reactions seem to be distinguished from other goal reactions only in that they all occur at a certain place in the environment, which lies in a specified (again environmentally determined) direction from the starting point. But are these goal reactions identical from the point of view of proximal determination? That would be the case only if, for instance, the movements of the rat in eating the food (i.e., the real response) varied when the rat approached the food from different points of the environment, and were the same when it approached from the same place. In other words, we could make this assumption only if there were a differentiation in the movements corresponding to the differentiation of the environmental space, and in some way coordinated to the spatial relation between starting point and goal. Actually, however, the identity of goal reactions is not determined proximally: two occurrences of goal reaction are called the same goal reaction when they occur at the same place in the environment. Thus we find that in this theory also the identical element conceals distal determinants behind apparent proximal determinants; it is a case of disguised focus.

Many critics have objected to the use of environmental (distal) determinants in stimulus-response theories. The following quotations are examples of such objections:

> ... the conditioned response formula seems to me inadequate in that the two stimuli and the two responses which are picked out in the above example by the conditioned response formula are not, it must be observed, stimuli and responses in any strict physiological sense. They are not physiologically, but environmentally defined affairs. Thus food and string, as visual, olfactory, and tactual stimuli patterns, may be quite different from occasion to occasion. They retain their respective identities from time to time only by virtue of their environmental "meanings." And eating and string-pulling, as responses, do not correspond to specific and invariant sets of muscle contractions, but are only identifiable through successive times in terms of environmentally nameable "manipulations" ... the conditioned response formula ... must be loosened so as to allow both "stimuli" and "responses" to be identifiable in terms of relatively gross and meaningful characters and not in terms of any precise or necessarily constant sense-organ and muscle processes [Tolman, 1937, p. 200].
>
> These supplementations do more than call attention to the complexity of stimulus-response relationships in conditioning experiments; they introduce terms such as direction, organization, means-end relationships, which are foreign to the logic of stimulus-substitution. To confess that the bold statement of association by contiguity is unsatisfactory because we oversimplify the items which are contiguous is one thing; to supplement the concept with heterogeneous organizing principles not coherent with it is another [Hilgard, 1936, p. 550].

Sometimes it is believed that the variations in the stimuli and responses, which are meaningful if they are determined environmentally, can be explained away by pointing out that there are random variations in every stimulus-response experiment (see Hilgard, 1936, p. 373). However, distal order cannot be derived from proximal disorder. A demonstration of the variations in the stimuli and responses shows only that the function between them is more complex than originally assumed; but it does not explain why it is possible to find distal constants in these proximal variations. Tolman has stated:

> ... there is a big difference between admitting that stimuli or responses probably vary from time to time and being able to give any account of (in truly stimulus-response terms) why they can

> nonetheless be called identical with their former selves. It is this latter requirement which I think both Guthrie and Skinner have failed to satisfy [1937, p. 201, note].[6]

"Why they can nonetheless be called identical with their former selves"—that, indeed, is the central problem for any theory using stimulus-response terms. It is the problem of reducing distal terms to proximal terms.

Thus we see that all the theories that employ proximal determinants, whether in terms of perception or of stimulus-response, are faced with the problem of explaining the existence of relevant distal determinants. The weak point of these theories seems to be that they end up by substituting distal for proximal determinants without realizing the change of focus.

### *Theories in Terms of Distal Determination*

Distal determination of the entities to be coordinated to the processes in the organism seems at first sight to be entirely possible. Hobhouse, for instance, comes to the conclusion that the organization of observations in distal terms is as legitimate as the organization in terms of proximal determination.

> If a philosopher from another planet, ignorant of all forms of life as they exist upon this world, were to watch a stone rolling downhill and a man running to catch his train, he would come to the conclusion that the stone and the man were actuated by very different principles. He would, for example, see the man go round the obstacle which caught up the stone, and if he proceeded to compare their behavior under many circumstances and in different relations, he would arrive at the result that the broad difference could be most easily formulated by conceiving the stone's action as determined always by the reaction of its inherent qualities upon the forces directly impressed upon it without regard to the ultimate issue, while the man's action would be, in the majority of cases, determined by its relation from moment to moment to some result more or less remote. . . . That is to say, proceeding purely by inferences based on comparison of behavior, he would discover two fundamentally distinct types of correlation, one in which each element of behavior is conditioned by its relation to its result, the other in which no such relation is operative although the result is in fact produced. Now he might ultimately decide that these two types are reducible to one.

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[6] See also Köhler (1929, p. 122) and Klüver (1933, p. 344ff.).

> . . . But even in the latter alternative he would still acknowledge two clearly distinct types of correlated behavior, in one of which the bearing of act on result is operative, while in the other it is not. He would now hold that this relation is made operative by a mechanical arrangement. But operative it still would be, and this would generically distinguish the type of correlation from the type in which there is no such element operating [Hobhouse, 1926, p. 15].

Hobhouse means that, even if we are able to reduce distal to proximal determination, we have to acknowledge that we find in observation cases which give constant coordinations in distal terms. And that is perfectly true, if one limits oneself to a "majority of cases"; however, there is no distally determined process or movement of the organism which could not be disturbed or made impossible by processes coordinated with proximal events. Pure distal determination is an absurdity; it would mean perception without sense stimulation and action without muscle contraction. And worse still, it would be a logical impossibility, because distal determination without coordinated mediating processes could give, in the last analysis, no definite determination at all. If perception is entirely determined by the distant environment, what determines which object is perceived in a concrete situation? Distal determination seems to imply the impossibility of complete determination, and that may be the real cause for the general distrust of distal determinants.[7]

Without doubt, the most imposing system using distal determination is Brunswik's psychology in terms of objects. It is important not only because it stresses distal determinants, but also because it offers concepts and methods which allow systematic experimentation. It seems to be the ideal fulfillment of Holt's program, to find "that object, situation, process of which . . . behavior is a constant function" (1915, p. 161). At first sight, this psychology seems to combine distal and proximal determination, since the "real objects" of perception or action are determined both in terms of the environmental objects and in terms of stimuli.

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[7] The impossibility of complete determination in distal terms is clearly expressed by Brunswik, although his own theory is based on distal determinants: ". . . we are dealing with casually distant effects, for which all conditions are not yet ascertained. The relation is therefore not one which is univocally determined in advance but only a more or less probable one. For, it is always possible that unexpected 'marginal' causal chains interfere, or that conditions are absent which one can expect in a normal environment" (1938, p. 18f.).

However, we find that the role of the stimuli in mediation and their place "between" objects and the organism is more or less disregarded. Brunswik writes:

> All of the above facts concerning the functioning of the organism in perception suggest a general way of consideration which would seem to be the one most profitable for psychology. Thus, both for reception and for action, it turns out that the special manner in which anything is mediated (or done) is not especially essential or significant. One and the same means-object may be represented at different times by very different stimulus configurations. And one and the same goal may be reached equally well by very different kinds of movements and means-object manipulations. The focal-points of life occurrences, *i.e.,* means-objects and final goal-effects, lie, respectively: relatively far away in time and space, backward (in cognition), or forward (in action). They are removed from the actual stimulus conditions and the actual body movements, so that the really significant question always is: What are the kinds of such objects and final goal-effects which the organism is able to attain independently of all varying circumstances with a relatively large degree of accuracy and probability; achieving them by perception, on the one hand, and by action, on the other. In short, questions of "what" are much more important in psychology than questions of "how." And thus to seek to describe the abilities and performance of an organism, by giving an inventory of the kind of objects attained by it, may be called "Psychology in Terms of Objects." In principle, this viewpoint need not have any concern with the organism's actual sensory, nervous, or motor conditions—*i.e.,* with mere mediation problems, as studied in traditional behaviorism, psychophysics, and physiological psychology [1936, p. 125].

As we can see, mediation problems, or problems of proximal determinants, have no place in a psychology in terms of objects. At best, mediating entities are considered in their role as good or bad cues for the distant objects (see especially Tolman and Brunswik, 1935).

What kind of psychology can be built upon such foundations, what determination-tendencies can it satisfy? It is true that it is flawless from the point of view of a positivistic program, and that it is carefully grounded in observation and is verifiable by experiment. It blocks, however, the tendency to unified determination and it fails to make possible complete determination. Unified determination is not attempted, since its goal is an "inventory," a multitude of coordinations which it cannot, and does not, strive to reduce to coordinations of a higher order. Because it only asks "what" and not "how," it cannot achieve complete determination. If it were to ask "how," and if it wanted to describe completely the processes involved in a single concrete case of behavior, it would have to consider proximal and interior determinants; it is, in the end, even questionable whether it is possible to give a complete answer to the question "what" without doing so.[8]

These remarks are not intended to belittle the importance of the theory. It is a substantial contribution to the development of psychology, since in theories which emphasize proximal determinants many distal coordinations have been neglected, even when, in principle, the fact of relevant distal determinants has been taken into account. There are many fields of psychology in which we are still ignorant of the distal coordinations of behavior, and often the problem has not even been properly stated. The psychology of the mental development of the child, or of language, offers many examples. An experimental method of determining the "attained objects" of behavior can certainly contribute much to the body of psychology.

### *A Theory in Terms of Orientation*

The theory of tropism, as it is presented by Crozier and Hoagland (1934), coordinates "stimuli" with "orientation," that is to say, direction which is determined in relation to the environmental space. Not what is closest to the skin-muscle contractions or movements of the limbs is taken as the focus, but an effect, an achievement of the movement of the limbs. Thus this theory goes a step beyond pure proximal determination. Determination by orientation lies between determination by the movements of the organs and distal determination in terms of the objects of the environment.

From the following quotations it will be clear that the authors distinguish sharply between proximal determination and determination in terms of orientation, and that they do not think that the second can be reduced to the first.

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[8] Brunswik himself recognizes that "what" and "how" problems are intimately connected: "Since the ways of mediation will always determine the achievement, the highly abstracted type of object-critical analysis as outlined above would lead, ultimately, to a statement of all psychologically relevant types of "how"-problems and -findings in terms of "what," *i.e.*, of objects attained" (1937, p. 251, note).

> Since the anatomical basis for such actions is quite different in diverse organisms, but the behavior element dynamically identical, it is clear that the quantitative formulations arrived at refer to the *behavior,* and not to specific accidents of structure . . . [Crozier and Hoagland, 1934, p. 6].

The "anatomical basis" and "accidents of structure" are proximally determined entities; the "dynamically identical behavior element" refers to orientation.

### *Gestalt Theory*

In order to describe the focal terms of Gestalt theory, we do best to present first the reasoning we find in Chapter III of Koffka's *Principles of Gestalt Psychology* (1935). The question, in what terms should one describe perceptual processes, is put in the form: why do things look as they do? (p. 76ff.).

*1.* Distal determinants.—"A first answer would be: things look as they look because they are what they are." The method of finding out whether this answer is adequate is to "single out a few aspects of behavioral things and compare them with real ones." That is to say, one may determine how constant the coordinations between perceptual phenomena and distant objects are. Of course, it is easy to find cases in which there are no constant coordinations, such as the moon illusion where there is no constancy. Distal determinants are therefore discarded, because there are cases of disagreement.

*2.* Proximal determinants.—We have to distinguish between (*a*) local proximal determinants and (*b*) nonlocal proximal determinants.

*a.* Local proximal determinants.—A second possible answer is: "Things look as they do because the proximal stimuli are what they are" (p. 80ff.). Again, we find many cases in which there is no correspondence between the local proximal stimulus and the perceptual phenomenon. For example: "The constancy of real things is to a great extent preserved in the constancy of the *phenomenal* things despite variations in their proximal stimuli" (p. 83).

*b.* The principle of nonlocal proximal determination has to be accepted. For example: "If, without a table and even without a light . . . , we could produce the same pattern of excitation . . . which is ordinarily produced on our retinæ when we fixate a table, then the person on whose retinæ these excitations were produced should and would see a table" (p. 79). That means, in such an experiment we would find the perceptual process coordinated only to proximal events, not to objects.

Thus both distal and local proximal determinants are discarded; that distal determination is possible in many cases is recognized but used only in the refutation of local proximal determination. Only nonlocal proximal determinants are accepted, and that means for Gestalt theory that external determination is made in terms of stimulus patterns, internal determination in terms of fields and Gestalt processes. Koffka (1935) states:

> All we intend to do is to replace laws of local correspondence, laws of machine effects, by laws of a much more comprehensive correspondence between the total perceptual field and the total stimulation . . . [p. 97]. Things look as they do because of the field organization to which the proximal stimulus distribution gives rise [p. 98].

Thus we find the program of Gestalt psychology to be: perceptual processes have to be defined in terms of stimulus pattern and field organizations; the question, "Why do things look as they do?" should be answered in these terms.

Gestalt theory has found a new device for the derivation of distal from proximal determination. As we have seen, several forms of conditioned reflex theory take into account both proximal and distal determinants. They make use of local proximal determination and from it derive distal determination by the device of selection. For Gestalt theory, too, it is possible to take into account both kinds of determinants. However, it does not derive the one from the other in a way which makes the derived focus a spurious one.

Let us consider, as an example, visual fixation and pursuit (Koffka, 1935, p. 311ff.). As long as we determine the coordinations proximally and locally, in terms of peripheral movements and sensations (or local stimuli), we find a bewildering confusion without constancy. Distal determination is in many cases easy: the eye is tuned in on the object world, it follows moving objects, etc. The problem is: how can we anchor distal determination in proximal determination, how can we exclude teleology?

The solution proposed by Gestalt psychology is the following: it is wrong to start with an identification of muscle movement *qua* movement (local determinants), and then hook on to these entities connections which are forced upon the organism by the contact with the environment. Muscle movements and stimuli are of course there and play their role in the process, but they can be determined only as parts of an organization. And this organization takes care of the distal determination at the same time. According to Koffka (1935), ". . . a stimulus inhomogeneity [starts the movement] and the movement takes place in such a way that this stimulus inhomogeneity is brought into the center of the retina" (p. 313).

The organization in which the local stimulations and the local movements are embedded is of such a kind that it gains its equilibrium when the requirements of distal coordination are fulfilled; that is to say, when the eye is directed toward the object, which is coordinated to the stimulus inhomogeneity. In this way proximal and distal determinants, the local events and their "achievement," are brought into harmony. The model of this combination is taken from physics. In physics, too, an event can often be described in both proximal and distal terms.

> We may best visualize the relationship between the responses that make up the so-called purposive behavior category by the raindrop analogy. We may start with the assumption that every drop of rain in some way or other gets to the ocean. . . . Anthropomorphizing this condition, we may say that it is the *purpose* of every drop of rain to get to the ocean. Of course, this only means that virtually every drop *does* get there eventually. How it gets there depends upon where it falls. . . . Each stage, each fall from one leaf to the next, may be designated as a *means* toward the final end, the sea, and a number of the intermediate stages may be grouped together and the terminal stage designated as the purpose of the antecedent stages. . . . Human behavior is merely a complication of the same factors. Instead of only a few physical forces such as gravity, temperature, humidity, surface tension, friction, that act on the drop of rain, the stimuli which act on the sensori-motor system of man are much more numerous [Weiss, 1925, p. 346f.].

Gestalt psychologists can agree essentially with these statements of Weiss. They show that distal determination in physics is in principle identical with that of behavior, and that physics makes use of a device which resolves distal into proximal determination. Thus it does not leave teleology hanging in the air. However, the most important concept by which physics achieves this end is not given enough credit in the above quotation. It is the gravitational field and not leaves, ground, or arbitrarily arranged forces which make the movement of the drop of water one which can be determined distally. Field and equilibrium are the concepts by which in physics the distal determination is made congruent with the proximal. The field brings together the end of the movement and the forces which affect the moving body directly and makes them actually one and the same thing. The "goal" is a unique place within a field at every point of which there are forces directed toward this place. Field determination is really neither distal nor proximal determination; both these determinants are merely aspects of field determination.

The total process of a psychological organization is, of course, much more complicated than the organization of these simple physical examples. Several regions often take part in the total process, regions which have more or less autonomous organizations.

In the actual work of Gestalt psychology, we find a discrepancy between the treatment of perceptual problems and that of behavioral problems. The coordination of the organism to the object world, that is to say, distal determination in terms of the objective environment, is considered and "explained" in the treatment of the psychology of action. In the treatment of perception, however, the fact of correspondence to the object world is often neglected and the goal, or final state toward which a process is directed, is determined in terms of figural properties.

It is significant that Koffka (1935) introduces his discussion of action with a section which is headed: "The Results of Behavior" (p. 306). In this chapter we read:

> . . . if we want to explain behaviour, behaviour which has been such a powerful agent in the world, can we ever hope to succeed if, right at the outset, we forget what behaviour has accomplished? That is to say, must we not, in order to explain behaviour, first gain some knowledge about those universal aspects of behaviour which have been responsible for its success? Will it do to introduce explanatory principles indifferent to the results of behaviour, principles which would explain as well, or better, utter chaos . . . ? [p. 307].

However, in the chapter on the constancies, we read:

> . . . the connection between this uniqueness of one set of conditions and its cognitive value should not be used in any sense as

> explanatory of the uniqueness ... the constancy problem should be re-formulated in this way: What shape, size, brightness, will correspond to a certain local stimulus pattern under various total external and internal conditions? Once we have answered this question we shall know when to expect constancy, when not. Indeed some effects of non-constancy are just as striking as the effects of constancy which have been so much emphasized ... [1935, p. 227].

Does that not mean that we should "introduce explanatory principles indifferent to the results" of the perception?

Thus we find an inconsistency in the attitude toward distal determinants. Especially in perceptual problems, Gestalt theory has limited itself to an investigation of figural organizations, and has more or less disregarded the original program of taking into account the "achievements" in terms of equilibria. The original program was to make "meaning" dynamically real and to give a solution of the problem of the coordination of the organism to the object world.

This is also the meaning of the claim of Gestalt psychology to make the "order" in the psychological processes understandable. Order always refers to some particular kind of determination. Something can be orderly in regard to one determination and disorderly in regard to another. The order about which Gestalt psychology talks in its general program is mainly the order we find when we determine the events distally. As Köhler (1929) has said: "All this order is as remarkable as it is necessary for our response to the objects which, in the form of bodily movement, must be adjusted properly to the physical world" (p. 115). That other systems of psychology failed to explain adequately the coordination of the organism to the environment is again and again pointed out by Gestalt psychologists.

However, as we have seen, in the psychology of perception the environmental distal determination is disregarded. The focus is placed in the figural, geometrical properties of the stimulus pattern, and the distal determinants which are used are figural-distal determinants; i.e., the fact is pointed out that we can often describe perceptual processes as tending toward a certain configuration.

We have seen that distal determination does not order the events in the same way as local proximal determination; we have to add it does not order them in the same way as figural determination.

That means that when we determine in terms of figural properties we have not yet solved the problem why environmental distal determination is possible. This fact has been pointed out by several authors:

> The same thing can "express itself" in many different stimulus patterns, which are different from a figural point of view as well; and we can recognize it through these different mediations [see Chap. 2, p. 40ff.].
>
> One can call this multitude of possibilities a transposibility—perhaps "sign transposibility." This is different from the gestalt or sum-transposibility and plays, so far, only an unimportant role in gestalt psychology. For, the different equivalent possibilities do not show common form (figural) properties . . . but only common empirical significance (*Bewährung*) . . . they have in common their character as a sign of something that is causally more distant than they are [Brunswik, 1934, p. 228].

Thus we see that Gestalt psychology has developed a new device for the solution of the problem of the discrepancy between proximal and distal determination. However, it has not made use of this device consistently, and in some cases it has lost sight of the environmental distal determinants. Connected with this is the fact that it has not yet developed a theory of experience in terms of organization; it does not account for the fact that contact with the environment makes the organism more coordinated with it. Of course, the limitation to an intense study of figural processes was probably very wise; one might only raise the question whether the psychology of perception in its present stage would not be advanced greatly by a more extensive consideration of distal environmental coordinations.

## SUMMARY

In organizing any data one can apply an infinite number of determinants. Scientifically fruitful and relevant determinants are those that yield constant coordinations. This empirical test may lead to rival determinations: at least in a first approximation the same group of data can sometimes be determined relevantly in two or more different ways.

In order to escape the dilemma of multiple determination one kind of determinant is often selected as primary and the attempt is then made to derive the fact that other relevant determinants exist from this primary determination. These derivations follow certain patterns; derivation by selection is a common type. Empirical findings are not always responsible for the selection of a particular determination. We find *a priori* tendencies which favor certain determinants.

Questions of determination are especially important in psychology because there are several regions involved in every psychological process. The rivalry between proximal and distal determinants is one of the most significant for psychological theories. Theories using proximal determinants as the primary ones are faced with the problem of explaining the existence of relevant distal determinants. In the attempts to solve this problem use is often made of the device of derivation by selection. It can be shown, however, that the apparent success of these derivations is brought about by the unnoticed introduction of distal determinants into the assumptions from which these determinants are supposedly derived.

Theories using distal determinants as the primary ones are faced with the problem of what to do with the fact of relevant proximal determinants. They often state explicitly that this fact has no place in psychological theory. Thus the way to complete and unified determination is cut off.

Gestalt theory offers a framework of concepts which makes it possible to take both distal and proximal determinants into account and which resolves the dilemma of deciding between them. Gestalt theory, however, has not yet made consistent use of these concepts.

# 5

# THE DESCRIPTION OF THE PSYCHOLOGICAL ENVIRONMENT IN THE WORK OF MARCEL PROUST

Novelists who have the reputation of being good psychologists can give evidence of their knowledge of human nature in different ways. A Dostoyevsky amazes us by convincing descriptions of persons on or beyond the borderline of normality; others reveal to us man's hidden motives, like vanity, egoism, and will to power; with still others psychological insight is more implicitly woven into the fiber of the story. Proust uses all these approaches in his analysis of people and social atmospheres; but he is unique in one respect: in the way in which he sifts and dissects each little event to try to describe the subjective environment of that moment. He wants to know how we perceive reality and how our subjective impressions are different from the objective world laid out in measurable time and space. His preoccupation with these questions leads him on and on in his descriptions of the French society of his day.

These problems belong to the field of perception in its broadest sense. Since this field is one which has been most thoroughly investigated by psychologists, it is not surprising that in Proust's work we find many points of contact with academic psychology. It is difficult to translate Dostoyevsky's insights into psychological terminology. But in Proust we find pages that seem to be written almost for the purpose of illustrating the laws that are found in psychological treatises. As the psychologist reads Proust, he is reminded especially of two somewhat related approaches to psychological problems. One is the theory of perception as Gestalt psy-

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Originally published in *Character and Personality*, 9:295-314, 1941.

chology has elaborated it; the other is developmental psychology as it is represented in the works of Piaget and Werner. Gestalt psychology, in its experimental studies, has dealt largely with perception in the normal adult. Developmental psychology is concerned with the mental processes in the undeveloped or regressed mind; it attempts to describe the perception, thought, and emotion of children, so-called primitive people, or psychotics.

A few remarks about developmental psychology may be in place. When we want to describe the psychological environment of children, we compare it with that of more logical and objective adults who possess a high degree of "object constancy." We then find in children "syncretic" and "diffuse" perception and thought (Werner, 1926). Their world shows a lack of differentiation between ego and objects. "Intelligence thus begins neither with knowledge of the self nor of things as such but with knowledge of their interaction, and it is by orienting itself simultaneously toward the two poles of that interaction that intelligence organizes the world by organizing itself" (Piaget, 1937, pp. 354-355). "For it is characteristic of primitive mental life that it reveals a relatively limited differentiation of object and subject, of perception and pure feeling, of idea and action, etc." (Werner, 1926, p. 59).

These conclusions are based on the observation of the behavior of animals, children, primitives, and psychotics. There are relatively few introspective reports available to complete the picture. The reason for this lack is obvious: persons of primitive mentality are usually not capable of that "objectivity" toward their own subjectivity which introspection demands.

Only in poets or writers of fiction do we sometimes find this combination of primitivity and intellectuality; and in no work of literature is it as perfect as in Marcel Proust's *Remembrance of Things Past,* which abounds in illustrations for a psychology of mental development.

That Proust has, in some respects, the mentality of a primitive has been noted by several of his critics, especially Dandieu (1930): "The confusion between present and past, subject and object, . . . are corrected or rather completed by what the sociologists call the sentiment of participation, which is the key to all magic operations and also the origin of Proust's metaphor" (p. 48; see also Ellis, 1935).

In what follows a few quotations are collected which show how Proust's descriptions of the psychological environment illustrate the analyses of Gestalt psychology and developmental psychology. But we do not attempt, of course, to give a complete picture of the psychology of Proust's personality, or of the many psychological insights which are contained in his writings.

## REGION, WHOLE SITUATION

When we examine the way in which Proust describes the properties of the psychological environment we find, first of all, that he is aware of the role played by greater units, regions,[1] and whole situations. He describes these units very convincingly when he talks of the two regions of the "Guermantes way" and the "Méséglise way":

> Since my father used always to speak of the "Méséglise way" as comprising the finest view of a plain that he knew anywhere, and of the "Guermantes way" as typical of river scenery, I had invested each of them, by conceiving them in this way as two distinct entities, with that cohesion, that unity which belongs only to the figments of the mind; the smallest detail of either of them appeared to me as a precious thing, which exhibited the special excellence of the whole. . . . But, above all, I set between them, far more distinctly than the mere distance in miles and yards and inches which separated one from the other, the distance that there was between the two parts of my brain in which I used to think of them, one of those distances of the mind which time serves only to lengthen, which separate things irremediably from one another, keeping them for ever upon different planes. And this distinction was rendered still more absolute because the habit we had of never going both ways on the same day, or in the course of the same walk, but the "Méséglise way" one time and the "Guermantes way" another, shut them up, so to speak, far apart and unaware of each other's existence, in the sealed vessels—between which there could be no communication—of separate afternoons [1913, p. 172f].

The view of Bergson or James, namely, that our consciousness consists of a continuous stream of ever changing happenings, is not held by Proust. This becomes especially evident when he describes a change from one whole situation to another. In this case we are likely to become aware of the existence of regions in our psychological environment, and of their sometimes sharply defined boundaries:

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[1] The terms "psychological environment" and "region" are not used in a narrow perceptual sense. In regard to the concept of psychological environment see Koffka (1935, p. 27ff.), and Lewin (1936, p. 18f.). Lewin, whose usage of the term *region* we follow, gives, among others, these examples for it: "region of a forest; a region within which one may be seen from a certain point; . . . the sphere of influence of a person; a social group; an occupation . . ." (Lewin, 1936, p. 94).

> [Approaching home after a happy walk,] I would know that in half an hour we should be at home, and that there . . . I should be sent to bed as soon as I had swallowed my soup, so that my mother . . . would not come upstairs to say good night to me in bed. The zone of melancholy which I then entered was totally distinct from that other zone, in which I had been bounding for joy a moment earlier, just as sometimes in the sky a band of pink is separated, as though by a line invisibly ruled, from a band of green or black. You may see a bird flying across the pink; it draws near the border-line, touches it, enters and is lost upon the black. The longings by which I had just now been absorbed, to go to Guermantes, to travel, to live a life of happiness—I was now so remote from them that their fulfillment would have afforded me no pleasure. How readily would I have sacrificed them all, just to be able to cry, all night long, in the arms of Mamma! . . . and this state would persist until the morrow, when . . . I would leap out of bed to run down at once into the garden, with no thought of the fact that evening must return, and with it the hour when I must leave my mother. And so it was from the "Guermantes way" that I learned to distinguish between these states which reigned alternately in my mind, during certain periods, going so far as to divide every day between them, each one returning to dispossess the other with the regularity of a fever and ague: contiguous, and yet so foreign to one another, so devoid of means of communication, that I would no longer understand, or even picture to myself, in one state what I had desired or dreaded or even done in the other [1913, p. 235f.].

This description reminds us of topological psychology (Lewin, 1936), in which terms like "region" ("zone" is used by Proust as equivalent to "region"), "sharpness of boundaries," "communication," etc., play a basic role. We may note at the same time that Proust uses both of the concepts which are, in topological psychology, fundamental for the determination of relationships between regions; that of locomotion ("entering the zone of melancholy," the analogy of the flying bird), and that of communication ("the sealed vessels—between which there could be no communication," "devoid of means of communication").

The effect of these regions on behavior is especially noticeable with persons of primitive mentality whose life space is less object-adequate.

> The fact that the primitive world may be built up out of different spheres, each of which is a self-contained unity, is of special importance for developmental psychology. These diverse spheres are determined by different drive patterns among which there is little intercommunicability. One sphere succeeds the other like scenes on a revolving stage . . since an object is reacted to according to its attachment to a certain sphere, it is to be assumed that the meaning of the "same" object changes from sphere to sphere. Only when . . . things can be grasped on the basis of different distinct aspects . . . is it possible to have an identity and constancy of things [Werner, 1926, p. 381].

We also want to call attention to another point in Proust's observation, namely, the fact that the forces and goals (desires, wishes, "drive patterns" in the quotation from Werner) may change with a change of region.

That the parts of a region exhibit the quality of the whole is also expressed clearly by Proust ("the smallest detail of either of them appeared to me as a precious thing, which exhibited the special excellence of the whole"). Gestalt-psychological experiments with abstract forms have proved that the appearance of the parts often depends on the characteristics of the whole. Werner (1926) points out that this dependence of the part on the whole is more pronounced in primitive perception. Object-constant perception presupposes independence, to a certain degree, of the appearance of the object from the setting. "The embedding of things in the concrete situation demonstrates clearly what is meant by a relatively global, or diffuse, type of organization" (p. 135). "In this diffusely organized, homogeneous perception it is fundamental that each constituent part contain some of the quality-of-the-whole, and that these parts be instinct with the situative meaning, the broader meaning of the totality" (p. 113).

In many places Proust explicitly describes the influence of embeddedness. A case which is taken from more peripheral perception and in which a veritable optical illusion resulted is the following:

> Her black eyes gleamed, and I did not at that time know, and indeed have never since learned how to reduce to its objective ele-

> ments any strong impression, since I had not, as they say, enough "power of observation" to isolate the sense of their colour, for a long time afterwards, whenever I thought of her, the memory of those bright eyes would at once present itself to me as a vivid azure, since her complexion was fair; so much so that, perhaps, if her eyes had not been quite so black—which was what struck one most forcibly on first meeting her—I should not have been, as I was, especially enamoured of their imagined blue [1913, p. 180].

The influence of embeddedness in a setting is also apparent in the following example:

> Every few minutes the little train brought us to a standstill in one of the stations which came before Balbec-Plage, stations the mere names of which . . . seemed to me outlandish, whereas if I had come upon them in a book I should at once have been struck by their affinity to the names of certain places in the neighborhood of Cambray. But to the trained ear two musical airs, consisting each of so many notes, several of which are common to them both, will present no similarity whatever if they differ in the colour of their harmony and orchestration. So it was that nothing could have reminded me less than these dreary names, made up of sand, of space too airy and empty and of salt, out of which the termination "ville" always escaped, as the "fly" seems to spring out from the end of the word "butterfly"—nothing could have reminded me less of those other names . . . which, because I had heard them pronounced so often by my great-aunt at table, in the dining-room, had acquired a certain sombre charm in which were blended perhaps extracts of the flavour of "preserves," the smell of the fire of logs and of the pages of one of Bergotte's books, the colour of the stony front of the house opposite, all of which things still to-day when they rise like a gaseous bubble from the depth of my memory preserve their own specific virtue through all the successive layers of rival interests which must be traversed before they reach the surface [1919, Part I, p. 335f.].

Proust shows in this description that he is fully aware of the fact that recognition failed to occur because the place names were imbued with the whole quality of the old setting. "A trace strongly 'embedded' in a trace system is less available for a new process than a trace loosely embedded" (Koffka, 1935, p. 623).

We add a few quotations which show how the home in which a beloved person lives, the things with which she is connected, form a region which stands out significantly from its background. The quality and the value which are attributed to the object of love, and even the history of that love give this region its specific coloring. These passages illustrate the fact that the needs of the person are factors in the organization of the life space into regions, and that needs can be responsible for figure-background relationships:

> My imagination had isolated and consecrated in the social Paris a certain family, just as it had set apart in the structural Paris a certain house, on whose porch it had fashioned sculptures and made its windows precious. . . . Just as my father and mother looked upon the house in which Swann lived as one that closely resembled the other houses built at the same period in the neighborhood of the Bois, so Swann's family seemed to them to be in the same category as many other families of stockbrokers . . . in order to distinguish in all Gilberte's surroundings, an indefinable quality analogous, in the scale of emotions, to what in the scale of colours is called infra-red, a supplementary sense of perception was required, with which love, for the time being, had endowed me; and this my parents lacked [1913, p. 536f.].
>
> All the ideas that I had formed of the hours, different from those that exist for other men, passed by the Swanns in that house which was to their life what the body is to the soul, and must give expression to its singularity, all those ideas were rearranged, amalgamated —equally disturbing and indefinite throughout—in the arrangement of the furniture, the thickness of the carpets, the position of the windows, the ministrations of the servants. When, after luncheon, we went in the sunshine to drink our coffee in the great bay window of the drawing-room, while Mme. Swann was asking me how many lumps of sugar I took, it was not only the silk-covered stool which she pushed towards me that emitted, with the agonising charm that I had long ago felt—first among the pink hawthorn and then beside the clump of laurels—in the name of Gilberte, the hostility that her parents had shewn me, which this little piece of furniture seemed to have so well understood, to have so completely shared that I felt myself unworthy, and found myself almost reluctant to set my feet on its defenceless cushion. . . . [1919, Part I, p. 158f.].[2]

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[2] The following passages are also relevant to the topic of this section. In regard to the concept of psychological environment in general: 1924, p. 255; 1925, p. 217. In regard to regions: 1913, p. 400f. (social regions in Swann's life); 1920, Part I, p. 31 (psychological boundary); 1925, p. 187f. (zones of substitute satisfaction). Closely related are the cases where he speaks of different "selves" instead of regions: 1919, Part II, p. 346; 1925, p. 17ff. For descriptions of physiognomic characters: 1919, Part II, p. 342 (faces); 1920, Part I, p. 103 (landscape); 1920, Part I, p. 69 (clothes). Needs as factors in the organization of the environment: 1919, Part I, p. 141 (region of loved person); 1919, Part II, p. 348 (face); 1919, Part II, pp. 55, 102f. (time). Embeddedness: 1920, Part I, p. 4f. (names); 1920, Part II, p. 123 (landscape).

## RESUSCITATION OF SITUATIONS

That a situation with all its original forces can be reinstated after a long interval during which other situations were dominant is shown by what Proust calls "intermissions of the heart." The narrator of the novels had always loved his grandmother dearly, but it was during a visit to Balbec, when he spent a vacation alone with her, that he had been most dependent on her. She died when they were in Paris again. The realization of what her death meant came to him only a whole year later when he was again in Balbec and when the situation of the previous summer was reinstated.

> . . . if the setting of sensations in which they [our joys and sorrows] are preserved be recaptured, they acquire in turn the same power of expelling everything that is incompatible with them, of installing alone in us the self that originally lived them. Now, inasmuch as the self that I had just suddenly become once again had not existed since that evening long ago when my grandmother undressed me after my arrival at Balbec, it was quite naturally, not at the end of the day that had just passed, of which that self knew nothing, but—as though there were in time different and parallel series—without loss of continuity, immediately after the first evening at Balbec long ago, that I clung to the minute in which my grandmother had leaned over me. The self that I then was, that had so long disappeared, was once again so close to me that I seemed still to hear the words that had just been spoken, albeit they were nothing more now than illusion, as a man who is half awake thinks he can still make out close at hand the sounds of his receding dream. I was nothing now but the person who sought a refuge in his grandmother's arms, sought to wipe away the traces of his suffering by giving her kisses, that person whom I should have had a great difficulty in imagining when I was one or other of those persons which, for some time past, I had successively been, as the efforts, doomed in any event to sterility, that I should now have had to make to feel the desires and joys of any of those which, for a time at least I no longer was [1921-23, Part I, p. 218ff.; see also 1925, p. 176f.; 1920, Part I, p. 104].

In this situation the reinstatement of the old situation was produced by the environment which was, with the exception of the absence of the grandmother, more or less the same as that of the original situation. In other cases situations are revived by a mere fragment of the original environment, and these play a central role in Proust's work.[3] The savour of a small cake (the famous *madeleine*), the sound of a spoon striking against a plate, the stepping on uneven flagstones, the starchy stiffness in a napkin, give rise to the experience of whole situations in which these fragments played a part.

> ... in stepping back, [I] struck my foot against some unevenly cut flagstones leading to a carriage house ... immediately all my discouragement vanished before a feeling of happiness.... A deep azure blue intoxicated my sight, impressions of coolness and dazzling light hovered near me and, in my eagerness to seize them, not daring to move—just as when I tasted the flavour of the *madeleine* and tried to bring back to my mind what it suggested to me—I stood there, swaying back and forth, as I had done a moment before, one foot on the higher stone and the other on the lower, indifferent to the possible amusement of the large crowd of chauffeurs. Each time that I merely repeated the action physically, the effort was in vain; but if I forgot the Guermantes reception and succeeded in recapturing the sensation I had felt the instant I placed my feet in that position, again the dazzling, elusive vision brushed me with its wings ... almost immediately I recognized it; it was Venice . . . which was brought back to me by the sensation I had once felt as I stood on two uneven flagstones in the baptistry of Saint Mark's, and with that sensation came all the others connected with it that day, which had been waiting in their proper place in the series of forgotten days, until a sudden happening had imperiously commanded them to come forth. It was in the same way that the taste of the little *madeleine* had recalled Cambray to my mind [1927, p. 191f.].
>
> What happened was that a servant, trying in vain to make no noise, struck a spoon against a plate. The same kind of felicity as I had received from the uneven paving stones now came over me; the sensations were again those of great heat, but entirely different, mingled with the odour of smoke, tempered by the cool fragrance of a forest setting, and I recognized that what seemed to me so delightful was the very row of trees ... which, in a sort of hallucination, I thought now stood before me.... I wiped my mouth with the napkin ... immediately ... a fresh vision of azure blue passed before my eyes; but this time it was pure and saline and it rounded upward like bluish breasts. The impression was so vivid that the moment I was reliving fused with the real present and ... I thought the servant had just opened the window toward the beach and everything called me to go down and stroll along the embankment at high tide; the

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[3] Proust's ideas of the involuntary memory play an important part in his own thinking about these phenomena. To discuss these would be beyond the scope of this paper; see Blondel (1932).

> napkin which I had taken to wipe my mouth had precisely the same sort of starchy stiffness as the towel with which I had had so much trouble drying myself before the window the first day of my stay at Balbec.... [1927, p. 192f.]

In the next quotation, the noise of a hot-water pipe reminds him of "blasts we sometimes heard of a summer evening from pleasure boats of Balbec."

> ... it was not merely an echo or a duplication of a past sensation which the sound of the hot-water pipe had just made me experience, but that very sensation itself. In that case, as in all the preceding ones, the sensation common to both occasions had sought to recreate about itself the former setting, while the present setting, which was occupying its space, opposed with all the resistance of its mass this invasion of a Paris residence by a Normandy beach or a railway embankment. The dining-room by the sea at Balbec... had sought to shatter the solidity of the Guermantes mansion and force open its doors, and it had for an instant made the sofas rock about me.... Always, in these resurrections of the past, the distant place, evoked about the common sensation, had grappled for a moment, like a wrestler, with the present scene [1927, p. 200].

It seems to us that the passages taken from Proust support Werner's analysis rather than an interpretation based on associationistic principles. Werner explains the arousal of whole-situations from a fragmentary part in children by the diffuse character of the child's experience of the situations. "The common, global significance of a situation in which any part may represent the whole . . . acted again to occasion an identical reaction in a similar version. It is because of this that a child often tries to complete a situation on the basis of a fragmentary part which, for the adult, might not necessarily show any relation at all to the whole, but which, for the child, may be shot through with the same coloration as the previously experienced total situation" (Werner, 1926, p. 114).

It is always the "coloration," the physiognomic quality of the total situation, which is first aroused ("impressions of coolness and dazzling light," "sensations of great heat mingled with the odour of smoke, tempered by the cool fragrance of a forest setting," "azure blue—rounded upward like bluish breasts"). Only further search discloses the more objective properties of the original situation.

Another interesting feature of these experiences is their hallucinatory character. It reveals that the differentiation into ego and environment is not fully developed and that the boundary between them is not laid out in the same way as it is in a more "objective" person. "Everywhere in primitive society we find that visionary appearances not only are accorded an objective value, but are also invested with a superior significance, in that they may even supersede the common reality of life from day to day" (Werner, 1926, p. 146). For Proust these visionary remembrances are certainly "invested with superior significance." In the first sixty pages of the second part of *Past Recaptured* he explains how his whole philosophy of life and art and his attitude to reality is based on them.

## FRAMEWORK

The influence of spatial and temporal framework is described by Proust in several places. This framework, which determines where in time and space we "are" phenomenally and dynamically, is (cf. Koffka, 1935, Chap. V-VII), although it has far-reaching psychological effects, often not manifest, probably because it corresponds so often to the measurable reality. Proust catches it at the one moment when in everyday life its reality is most easily observed, at the moment of awakening in an unusual situation, which has disturbed the smooth working of the framework mechanism.

> When a man is asleep, he has in a circle around him the chain of the hours, the sequence of the years, the order of the heavenly host. Instinctively, when he awakes, he looks to these, and in an instant reads off his own position on the earth's surface and the amount of time that has elapsed during his slumbers; but this ordered procession is apt to grow confused, and to break its ranks. Suppose that, towards morning, after a night of insomnia, sleep descends upon him while he is reading, in quite a different position from that in which he normally goes to sleep, he has only to lift his arm to arrest the sun and turn it back in its course, and, at the moment of waking, he will have no idea of the time, but will conclude that he has just gone to bed. Or suppose that he gets drowsy in some even more abnormal position; sitting in an armchair, say, after dinner: then the world will fall topsy-turvy from its orbit, the magic chair will carry him at full speed through time and space, and when he opens his eyes again he will imagine that he went to sleep months earlier and in some far distant country. But for me it was enough if, in my own bed, my sleep was so heavy as completely to relax my

> consciousness; for then I lost all sense of the place in which I had gone to sleep, and when I awoke at midnight, not knowing where I was, I could not be sure at first who I was; I had only the most rudimentary sense of existence, such as may lurk and flicker in the depth of an animal's consciousness; I was more destitute of human qualities than the cave-dweller; but then the memory, not yet of the place in which I was, but of various other places where I had lived, and might now very possibly be, would come like a rope let down from heaven to draw me up out of the abyss of not-being, from which I could never have escaped by myself: in a flash I would traverse and surmount centuries of civilization, and out of a half-visualised succession of oil-lamps, followed by shirts with turned-down collars, would put together by degrees the component parts of my ego [1913, p. 3f.; see also 1920, Part I, p. 112; 1921-23, Part II, p. 175].

In this description the role of the framework in the constitution of the ego is stressed. In the following paragraphs we find an observation of a reorganization of the framework; it had been, from memory, erroneously constructed and was set right as soon as an outside stimulus affected the organization.

> It is true that, when morning drew near, I would long have settled the brief uncertainty of my waking dream, I would know in what room I was actually lying, would have reconstructed it round about me in the darkness—and fixing my orientation by memory alone, or with the assistance of a feeble glimmer of light at the foot of which I placed the curtains and the window—would have reconstructed it complete and with its furniture, as an architect and an upholsterer might do, working upon an original, discarded plan of the doors and windows; would have replaced the mirrors and set the chest-of-drawers on its accustomed site. But scarcely had daylight itself—and no longer the gleam from a last, dying ember on a brass curtain-rod, which I had mistaken for daylight—traced across the darkness, as with a stroke of chalk across a blackboard, its first white correcting ray, when the window, with its curtains, would leave the frame of the doorway, in which I had erroneously placed it, while, to make room for it, the writing-table, which my memory had clumsily fixed where the window ought to be, would hurry off at full speed, thrusting before it the mantelpiece, and sweeping aside the wall of the passage; the well of the courtyard would be enthroned on the spot where, a moment earlier, my dressing-room had lain, and the dwelling-place which I had built up for myself in the darkness would have gone to join all those other dwellings of which I had caught glimpses from the whirlpool of awakening; put to flight

> by that pale sign traced above my window-curtains by the uplifted forefinger of day [1913, p. 240f.].

## ASPECTS

We shall now quote a few examples in which it is the history of the approach or the mediation which determines the appearance of an object. This case shows effects similar to those of embeddedness in a whole situation. One and the same object, when embedded in two different whole situations, can appear as two different objects; similarly, one and the same object, perceived from two different sides, can appear as two different objects. This happens when the aspects are not considered only in their role as mediators of objects; in other words, when the aspect, which includes a relationship between person and real object, is interpreted as a property of the object. When an object is given us in two different aspects we often hardly recognize it as the same; or, when it is recognized, we are confronted by the problem of two things being the same and not the same. Usually we are not aware that only certain aspects of objects are given to us. However, when two aspects of the same object conflict, we realize the fact that the appearance of objects can depend on, among other things, the history of our approach and on the particular circumstances of mediation.

Proust's ideas about the role which aspects play in our perception are most articulately expressed when he deals with the "perception" of personalities. Often, in order to demonstrate the general validity of his observations, he takes analogies from the field of visual perspective, where the influence of the point of view on the appearance of objects is most obvious:

> The good and bad qualities which a person presents to us, exposed to view on the surface of his or her face, rearrange themselves in a totally different order if we approach them from another angle—just as, in a town, buildings that appear strung irregularly along a single line, from another aspect retire into a graduated distance, and their relative heights are altered [1919, Part II, p. 241].
>
> Apart from the most recent applications of the art of photography—which set crouching at the foot of a cathedral all the houses which, time and again, when we stood near them, have appeared to us to reach almost to the height of the towers . . . bring into actual

> contact the two columns on the Piazetta which a moment ago were so far apart, thrust away the adjoining dome of the Salute, . . . I can think of nothing that can so effectively as a kiss evoke from what we believe to be a thing with one definite aspect, the hundred other things which it may equally well be since each is related to a view of it no less legitimate. In short, just as at Balbec Albertine had often appeared to me different, so now, as if, wildly accelerating the speed of the changes of aspect and changes of colouring which a person presents to us in the course of our various encounters, I had sought to contain them all in a space of a few seconds so as to reproduce experimentally the phenomenon which diversifies the individuality of a fellow creature, and to draw out one from another, like a nest of boxes, all the possibilities that it contains, in this brief passage of my lips towards her cheek it was ten Albertines that I saw; this single girl being like a goddess with several heads, that which I had last seen, if I tried to approach it, gave place to another [1920, Part II, p. 76f.].

How the picture of a person must be reorganized when a new aspect has to be integrated into our concept of a personality is shown in the description of the scene in which the narrator learns that M. de Charlus is homosexual:

> From the beginning of this scene a revolution, in my unsealed eyes, had occurred in M. de Charlus, as complete, as immediate as if he had been touched by a magician's wand. . . . Those of my readers who do not care to refer, for examples of this law, to the Messieurs de Charlus of their acquaintance, whom for long years they had never suspected, until the day when, upon the smooth surface of the individual just like everyone else, there suddenly appeared, traced in an ink hitherto invisible, the characters that compose the word dear to the ancient Greeks, have . . . only to remind themselves how many times . . . they have found themselves on the point of making a blunder. Nothing upon the blank, undocumented face of this man or that could have led them to suppose that he was precisely the brother, or the intended husband, or the lover of a woman of whom they were just going to remark: "What a cow!" But then, fortunately, a word whispered to them by someone standing near arrests the fatal expression on their lips. At once there appear, like a *Mene, Tekel, Upharsin,* the words: "He is engaged to," or, "he is the brother of," or, "he is the lover of the woman whom we ought not to describe, in his hearing, as a cow." And this one new conception will bring about an entire regrouping, thrusting some back, others forward, of the fractional conceptions, henceforward a complete whole, which we possessed of the rest of the family. In M. de Charlus another creature might indeed have coupled itself with him

> which made him as different from other men as the horse makes the centaur, this creature might indeed have incorporated itself in the Baron, I had never caught a glimpse of it. Now the abstraction had become materialised, the creature at last discerned had lost its power of remaining invisible, and the transformation of M. de Charlus into a new person was so complete that not only the contrasts of his face, of his voice, but, in retrospect, the very ups and downs of his relations with myself, everything that hitherto had seemed to my mind incoherent, became intelligible, brought itself into evidence, just as a sentence which presents no meaning so long as it remains broken up in letters scattered at random upon a table, expresses, if these letters be rearranged in the proper order, a thought which one can never afterwards forget [1921-23, Part I, p. 18ff.].

In the next example we see how conflicting aspects can make us skeptical of our ability ever to approach the reality of a person through his aspects. It is essentially the case of Locke's temperature illusion: the same water, when approached under different conditions, appears different. We derive from such situations arguments for the subjectivity of aspects.

> When Françoise, in the evening, was polite to me, and asked my permission before sitting down in my room, it seemed as though her face became transparent and I could see the goodness and honesty that lay beneath. But Jupien . . . revealed afterwards that she had told him that I was not worth the price of a rope to hang me, and that I had tried to insult her in every possible way. These words of Jupien set up at once before my eyes, in new and strange colours, a print of the picture of my relations with Françoise so different from that on which I used to like letting my eyes rest, and in which, without the least possibility of doubt, Françoise adored me and lost no opportunity of singing my praises, that I realised that it is not only the material world that is different from the aspect in which we see it; that all reality is perhaps equally dissimilar from what we think ourselves to be directly perceiving; that the trees, the sun and the sky would not be the same as what we see if they were apprehended by creatures having eyes differently constituted from ours, or, better still, endowed for that purpose with organs other than eyes which would furnish trees and sky and sun with equivalents, though not visual. However that might be, this sudden outlet which Jupien threw open for me upon the real world appalled me. So far it was only Françoise that was revealed, and of her I barely thought. Was it the same with all one's social relations? And in what depths of despair might this not some day plunge me, if it were the same with love? . . . At any rate I realised the impossibility of obtaining any

> direct and certain knowledge of whether Françoise loved or loathed me. And thus it was she who first gave me the idea that a person does not (as I had imagined) stand motionless and clear before our eyes with his merits, his defects, his plans, his intentions with regard to ourself exposed on his surface, like a garden at which . . . we gaze through a railing, but is a shadow which we can never succeed in penetrating, of which there can be no such thing as direct knowledge, with respect to which we form countless beliefs, based upon his words and sometimes upon his actions, though neither words nor actions can give us anything but inadequate and as it proves contradictory information—a shadow behind which we can alternately imagine, with equal justification, that there burns the flame of hatred and of love [1920, Part I, p. 82ff.].

That one and the same person can be seen by different people from different points of view is also discussed in the description of Swann's personality. The role Swann plays in the eyes of the narrator's relatives differs widely from that which he plays in the aristocratic circles of Paris (1913, p. 19ff.). Certainly we find many works of other writers in which aspects or the "angle of vision" plays an important part. But hardly anywhere do we find such detailed analysis and abstract formulations of the facts involved as we find in Proust's work.

We may also add here a few examples of egocentricity in which the role of aspects is exemplified by the difference between the picture that we form of ourselves, our actions, and words, and that which other people form of them:

> Each of our actions, our words, our attitudes is cut off from the "world," from the people who have not directly perceived it, by a medium the permeability of which is of infinite variation and remains unknown to ourself; . . . What we actualy recall of our conduct remains unknown to our nearest neighbor; what we have forgotten that we ever said, or indeed what we never did say flies to provoke hilarity even in another planet, and the image that other people form of our actions and behaviour is no more like that which we form of them ourself, than is like an original drawing a spoiled copy in which, at one point, for a black line, we find an empty gap, and for a blank space an unaccountable contour [1920, Part I, p. 373f.].

> We imagine always when we speak that it is our own ears, our own mind that are listening [1919, Part I, p. 264].

> That our words are, as a general rule, filled, by the person to whom we address them, with a meaning which that person derives from her own substance, a meaning widely different from that which we had put into the same words when we uttered them, is a fact which the daily round of life is perpetually demonstrating [1919, Part II, p. 252].

The most important application of this doctrine of aspects we find in Proust's theory of erotic fixation. At the same time this theory is illuminating in regard to his attitude toward reality. Often, the situation of the first encounter determines the role a woman plays in a man's life (Proust does not describe women in a corresponding situation). A man falls in love with a woman when he is separated from her by a great psychological distance, and when he thinks, erroneously or not, that the goal of his love is difficult to attain. Then he lets his imagination loose, he starts dreaming about her, and he fashions around a small core of reality a picture of his ideal. Just as in a Rorschach test, he projects his whole ego and attaches it to a kernel of reality. Only the fact that he knows very little about the real woman makes this possible; the "stimulus conditions" are weak.

> I realised also then all that the human imagination can put behind a little scrap of face, such as this girl's face was, if it is the imagination that was the first to know it; and conversely into what wretched elements, crudely material and utterly without value, might be decomposed what had been the inspiration of countless dreams if, on the contrary, it should be so to speak controverted by the slightest actual acquaintance. I saw that what had appeared to me to be not worth twenty francs when it had been offered to me for twenty francs in the house of ill fame, where it was then for me simply a woman desirous of earning twenty francs, might be worth more than a million, more than one's family, more than all the most coveted positions in life if one had begun by imagining her to embody a strange creature, interesting to know, difficult to seize and to hold. No doubt it was the same thin and narrow face that we saw, Robert and I. But we had arrived at it by two opposite ways, between which there was no communication, and we should never both see it from the same side. That face, with its stares, its smiles, the movements of its lips, I had known from outside as being simply that of a woman of the sort who for twenty francs would do anything that I asked. And so her stares, her smiles, the movements of her lips had seemed to me significant merely of the general actions of a class without any

distinctive quality. And beneath them I should not have had the curiosity to look for a person. But what to me had in a sense been offered at the start, that consenting face, had been for Robert an ultimate goal towards which he had made his way through endless hopes and doubts, suspicions, dreams. He gave more than a million francs in order to have for himself, in order that there might not be offered to others what had been offered to me, as to all and sundry, for a score. That he too should not have enjoyed it at the lower price may have been due to the chance of a moment, the instant in which she who seemed ready to yield herself makes off, having perhaps an assignation elsewhere, some reason which makes her more difficult of access that day. Should the man be a sentimentalist, then, even if she has not observed it, but infinitely more if she has, the direst game begins. Unable to swallow his disappointment, to make himself forget about the woman, he starts afresh in pursuit, she flies him, until a mere smile for which he no longer ventured to hope is bought at a thousand times what should have been the price of the last, the most intimate favours [1920, Part I, p. 213f.; see also pp. 235, 246].

Variance of a belief, annulment also of love, which, pre-existent and mobile, comes to rest at the image of any one woman simply because that woman will be almost impossible of attainment. Thenceforward we think not so much of the woman of whom we find difficulty in forming an exact picture, as of the means of getting to know her. A whole series of agonies develops and is sufficient to fix our love definitely upon her who is its almost unknown object. Our love becomes immense; we never dream how small a place in it the real woman occupies. And if suddenly . . . we cease to be uneasy, to suffer pain, since it is this pain that is the whole of our love, it seems to us as though love had abruptly vanished at the moment when at length we grasp the prey to whose value we had not given enough thought before. What did I know of Albertine? One or two glimpses of a profile against the sea. . . . Since my first sight of Albertine I had meditated upon her daily, a thousandfold, I had carried on with what I called by her name an interminable unspoken dialogue in which I made her question me, answer me, think and act, and in the infinite series of imaginary Albertines who followed one after the other in my fancy, hour after hour, the real Albertine, a glimpse caught on the beach, figured only at the head, just as the actress who creates a part, the star, appears, out of a long series of performances, in the few first alone. That Albertine was scarcely more than a silhouette, all that was superimposed being of my own growth, so far when we are in love does the contribution that we ourselves make outweigh—even if we consider quantity only —those that come to us from the beloved object. And the same is true of love that is given its full effect. There are loves that manage

> not only to be formed but to subsist around a very little core. . . . [1919, Part II, p. 218ff.].

> It is the terrible deception of love that it begins by engaging us in play not with a woman of the external world but with a puppet fashioned and kept in our brain, the only form of her moreover that we have always at our disposal, the only one that we shall ever possess, one which the arbitrary power of memory, almost as absolute as that of imagination, may have made as different from the real woman as had been from the real Balbec the Balbec of my dreams; an artificial creation to which by degrees, and to our own hurt, we shall force the real woman into resemblance [1920, Part II, p. 84f.].

> . . . a certain similarity exists . . . between all the women we love, a similarity that is due to the fixity of our own temperament. . . . They are, these women, a product of our temperament, an image inversely projected, a negative of our sensibility. . . . We understand the characters of people who do not interest us; how can we ever grasp that of a person who is an intimate part of our existence, whom after a little we no longer distinguish in any way from ourself . . . our curiosity as to the woman whom we love overleaps the bounds of that woman's character, which we might if we chose but probably will not choose to stop and examine [1919, Part II, p. 270f.].[4]

## PROUST'S PERSONALITY

We have seen that many of the quotations which we selected describe the functioning of a primitive mind. How can we combine this finding with the fact that Proust's intellect was extremely subtle and differentiated, and his sensitiveness oversophisticated? We cannot solve this problem; we can only state it in more explicit terms.

Two tendencies are discernible in Proust's attitude toward the world.[5] On the one hand he strives constantly to represent persons, situations, and social groups with the utmost objectivity and he attempts to construct their essential core by rational means. He tries to overcome the subjectivity of perspective aspects, observes the typical traits in persons and is interested in general laws. Not only is this tendency patent throughout his work, but he himself testifies to it.

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[4] The following references are also relevant to this section. In regard to aspects of persons: 1913, p. 525f.; 1919, Part I, p. 28; 1919, Part II, p. 242; 1921-23, Part II, p. 230; of faces: 1919, Part II, p. 301f.; 1920, Part I, p. 77; of a landscape: 1921-23, Part II, p. 207f. In regard to the egocentric image of ourselves: 1920, Part I, p. 373f; 1921-23, Part II, p. 268. There exist also a few beautiful passages in which the interaction of traces and "stimuli conditions" is treated: 1913, p. 21; 1920, Part I, p. 187f. We add these references here since they are related to the subject of this section. In regard to erotic fixation and the illusory picture of the loved person, see also: 1919, Part II, p. 243; 1920, Part I, p. 388; 1920, Part II, p. 73; 1921-23, Part I, p. 318f; 1921-23, Part II, pp. 218, 379.

> . . . it is the feeling for the general which in the future writer automatically selects what is general and can therefore enter into a work of art. For he has listened to the others only when, however mad or foolish they were, by repeating parrot-like what people of like character say, they had thereby become the prophet-birds, the spokesmen for a psychological law [1927, p. 230f.].

> I was not unmoved by these last examples, as always when, beneath the particular instance, I was afforded a glimpse of the general law [1920, Part I, p. 154].

> Like a geometrician who, stripping things of their perceptible qualities, sees only their linear substratum, what people said escaped me because what interested me was not what they wanted to say, but the way they said it insofar as it revealed their characters or their ludicrous traits; or, rather, there was one thing which had always been the object of my investigation because it gave me a very special pleasure, and that was the point that two human beings had in common. It was only when I caught sight of this that my mind . . . suddenly took up the chase joyfully, but what it then pursued—for example, the identical recurrence of the Verdurin salon in various times and places—was located halfway down, below the range of vision, in a zone somewhat recessed. . . . It was of no use for me to go out to dinner, I did not see the guests because, when I thought I was looking at them, I was looking through them as with an X-ray. The result was that, when I came to put together all the notes I had been able to make on the guests at a dinner, the pattern of the lines I drew represented a collection of psychological generalisations in which the special interest of the guests' remarks occupied hardly any place [1927, p. 24f.].

Opposed to this scientific tendency is a Bergsonian tendency in Proust. He is convinced that true reality can only be found in the sphere of subjective impressions, of the totality of experience; that is to say, only in organizations in which the ego elements are given full scope.

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[5] See Blondel (1932). We, however, do not agree with Blondel's solution of this problem.

> Only the subjective impression, however inferior the material may seem to be and however improbable the outline, is a criterion of truth and for that reason it alone merits being apprehended by the mind, for it alone is able . . . to lead the mind to a greater perfection and impart to it a pure joy [1927, p. 207].

Proust's difficulty in getting satisfaction out of contact with objective reality is related to this attitude.

> . . . I came to realise clearly that disappointment in a journey and disappointment in a love affair were not different in themselves but merely the different aspects assumed in varying situations by our inability to find our real selves in physical enjoyment or material activity [1927, p. 204].

> How many times in the course of my life had I been disappointed by reality because, at the time I was observing it, my imagination, the only organ with which I could enjoy beauty, was not able to function, by virtue of the inexorable law which decrees that only that which is absent can be imagined [1927, p. 197].

Havelock Ellis (1935) says of Proust: "We are thus led to various manifestations of ruptured vital contact with reality, marked in Proust as well as in Rousseau, the extreme sensitiveness, the morbid susceptibility, the aptitude for suspicion . . . which made relations with friends, and sometimes even with strangers, so difficult" (1935, p. 431).

His theory of art is based on this attitude to reality. At the beginning of the second book of *Past Recaptured* he explains in detail how he came to the conviction that the true task of the writer is to rediscover the subjective reality

> . . . from which we live so far removed and from which we become more and more separated as the formal knowledge which we substitute for it grows in thickness and imperviousness [p. 224].

> This work of the artist . . . is exactly the reverse of the process which, during every minute that we live with our attention diverted

> from ourselves, is being carried on within us by pride, passion, intelligence and also by our habits, when they hide our true impressions from us by burying them under the mass of nomenclatures and practical aims which we erroneously call life [p. 225].

We are reminded of a statement by Koffka (1935), who, in talking about physiognomic characters, says:

> We conclude that objects in the field may possess characters which can be expressed in terms neither of shape and colour nor of practical use, and which are apt to exert a powerful influence on our behavior. . . . Our preoccupation with practical use and scientifically classifiable properties has robbed our world of a good many of them. . . . On the other hand, if we can abandon our practical or scientific attitude, we become aware of more and more such characteristics. Among us the poets and artists are those who are most free from the craving for efficiency. And truly, for them the world is richer in such characters than it is for us [p. 359].

This attitude toward reality, which results in a suppression of the segregation into ego and environment, lies at the basis of the so-called primitive phenomena which abound in his work. We called this attitude Bergsonian, and, indeed, Bergson could have written the paragraphs we have quoted. Proust, however, is not at all a consistent Bergsonian.[6] Even in the description of the immediate data of consciousness we can discern his scientific tendency. He is not afraid of describing his findings by general concepts and he very often uses even spatial terms (see Dandieu, 1930, p. 190). And the first quotations we presented in this paper show that he did not see the "stream of consciousness" as a Heraclitean flux in Bergson's sense. He holds with modern psychology that often the sequence of phenomena is divided by sharply defined boundaries. Furthermore, a person who is totally immersed in his subjective experiences would not be able to bring out so clearly in what way they are subjective. Only by contrasting them with a differentiated environment is it possible to describe them. Most of the concepts of developmental psychology, as Piaget, Werner, and others have applied them, contain such a reference to an "objective" reality.

[6] See Dandieu (1930, p. 35n.), and Blondel (1932, p. 166ff.).

Proust, too, can give us an adequate picture of his experiences only by comparing them with a more object-constant reality.

We cannot explain this duality in Proust's ego-environment relationship. But we can understand that the coexistence of these two attitudes made it possible for him to give these beautiful descriptions of diffuse and syncretic phenomena.

## 6

# ON LEWIN'S METHODS AND THEORY

I want to talk about two aspects of Lewin's theory:[1] first, about his ideas on the relative autonomy of psychology, and second, about the notion of life space. Both conceptions appeared very early in Lewin's publications, and I thought it might be of interest if I described briefly the contents of his first book and first paper in which these ideas are foreshadowed.

I begin with the principle of the autonomy of psychological concepts, which has its roots in certain notions belonging to the philosophy of science, or "metatheory." A number of Lewin's early publications deal with this field, among them the book which he published in 1922. Its title might be translated as "The Concept of Identity in Time in Physics and Biology." The subtitle is "A Contribution to the Comparative Science of Science." In this book he compared different sciences and tried to define the basic differences between them. He dealt mostly with physics and biology, giving less attention to psychology. The central concept he used is "gen-identity," by which he meant the identity of objects over time. It is a unit formation which allows appearances of an object at different times to be treated as identical. For instance, physics considers its objects as extending over time; one speaks of one and the same stone or star although it has been observed at different times. Again, when we talk of the motion of an object, we imply gen-

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Kurt Lewin Memorial Award Address given at the Annual Meeting of the American Psychological Association, Cincinnati, Ohio, September, 1959. Also published in *Journal of Social Issues,* Supplement 13, 1960.

[1] I acknowledge my indebtedness to Leeper (1943), Deutsch (1954), and Cartwright (1959), who have given us excellent presentations of this theory.

identity, that is, we imply that at different times the same object is at different places.

One of the main theses of the book is that physics and biology use the concept of genidentity in different ways. Let us consider an egg and the two-year-old chicken that grew out of this egg. Egg and chicken are biologically genidentical, they represent different stages of development of the same biological object. However, physically they are not genidentical, because the molecules composing them have changed. In the same way a person at the age of forty is biologically identified with the same person at the age of twenty, though physically only a small number of the molecules may be the same. He may have changed as a biological entity, but the fact that we can speak of a change means that we refer what happened to one organism.

Thus, Lewin tries to show that there is an essential difference between physics and biology in the basic units of description used. This leads him to the view that a fundamental incommensurability separates sciences from each other; each science is a closed unit of systematically connected concepts. Paths of derivation lead along the lines of this network, but the propositions or laws of one science cannot be derived from those of another. Going from one science to another means to change completely the way of dividing up reality into units.

In a later paper (1926) he says there is a tendency in the development of sciences which leads to a sharpening of the differences between them. Each science gradually purifies its concepts and segregates itself more and more from its neighbors. In line with these ideas he says: "The yearning for meaning and unity of life must not look for an illusory satisfaction in the idea of a philosophical unit of science" (p. 73). In other words, he believed that the idea of an eventual unification of all sciences is wishful thinking. Of course, he was well aware of the fact that there are many bridges between the sciences, and he was all for building more of them, for instance, in intermediate fields like biochemistry, or physiological psychology. Nevertheless, from his point of view, they were bridges between regions whose concepts and propositions are basically different.

These ideas form the background of his conviction that psychology should strive to build up a more or less autonomous realm of concepts which form a closely knit system, and that as it develops it should become more aware of its own proper nature, that it should segregate itself from other sciences, for instance, physiology, and that it should, in this way, purify itself. Deutsch says about Lewin: "He takes the stand that psychological phenomena must be explained in psychological terms just as physical phenomena must be explained in physical terms" (1954, p. 183).

Another aspect of this conception of psychology is the emphasis on the central region and the relative neglect of peripheral input and output. Brunswik, who especially has stressed this feature in his descriptions of Lewin's theory, says "Lewin's system and its laws remain confined to a post-perceptual, yet prebehavioral . . . field in the central area" (1955a, p. 736). This is true—but as we state it we should add two points: first, Lewin did take perception and behavior into account as belonging to the boundary of the life space, though he never succeeded in formalizing the relation of this boundary to the life space itself. Second, in his experiments stimuli and action outcomes play important roles as observables.

Maybe we can make this last point somewhat clearer if we ask ourselves what is the point or the goal of a Lewinian experiment. In trying to answer that question we will do well to recall the physicist Lenzen's notion of the partition between observer and object. He says that

> If one touches a desk with a finger, the partition is between them. An observer, however, may be extended by mechanical devices. Bohr has cited the following example: If one firmly grasps a long stick in one's hand and touches it to a body, the body touched is the object of observation, and the stick is an apparatus that may be viewed as part of the observer. . . . If a physicist is looking at a pointer on a scale, its status depends on the purpose of observation. If he is using the instrument to measure an electric current, the pointer is an extension of the observer; the object is the electric current. If the physicist is calibrating his instrument, the pointer is part of the object of observation; the light by which the pointer is seen is then an instrument which belongs to the observer [Lenzen, 1955, 308-309].

That is, the instruments used in observation and measurement belong to the observer, they are the mediation and not the focus of observation, unless the reliability and validity of the instrument are in question. The difference between object and mediation is as important for the scientific gathering of data as it is for perception. We can try to set up the observables themselves as the focal points of our theoretical system and try to find the laws which may obtain between them; or we can consider the observables as something that will, under certain conditions, give us information about constructs lying beyond them. In Lenzen's terms, we can put the observer-object partition between observer and the directly observable, or between the directly observable and the construct.

I think one can say that for Lewin the partition between observer and object is at the life space; his primary concern is with what goes on in this life space; that is where he expects to find the relevant variables, the nodal points which will follow exact laws without exceptions.

In contrast to Lewin's concern with the life space, psychology today often considers input and output as the primary object of study; true enough, there are also intervening variables, but they play only an ancillary role. The psychologist deals with them somewhat reluctantly and then only because otherwise the relations between input and output become unmanageable.

For Lewin these so-called intervening variables are the focus from the start, and input and output are relegated to a secondary role; they are the tools of observation which make it possible for us to get a glimpse of the processes in the life space which are the ultimate object of observation. Only by referring these manifestations or offshoots to the central layer can one obtain laws related to each other in a wider system. In themselves they are surface phenomena, phenotypes, each of which is determined by a multitude of factors and therefore cannot be expected to have stability and invariance.

The difference between this centralist position of Lewin and a peripheralist position is shown, for instance, by Spence's (1944) clearly formulated and therefore valuable description of Lewin's theory. Spence says that Lewin is not concerned with laws linking stimuli with responses but with laws mediating between two different responses, one being what the subject says about the situation, the other, what the subject does in the situation. However, my own feeling is that this does not describe what Lewin was really doing. According to the tenor of Lewin's theory, the goal of psychological investigation is not to find response-response laws. Both behavior and description of the situation must be referred to constructs belonging to the life space; they must be used as indicators of the contents or processes of the life space. Lewin was studying the laws which obtain in the life space, and for him the partition between the observer and the object was located at the life space and not at the behavior.

In the same way, the physicist uses the pointer readings of his volt meter and his other meters as manifestations of properties of the electric current; he studies the laws of electricity and is not concerned with the motions of the pointer as such. Or, the astronomer does not study the very complicated light processes in front of his telescope; these light processes only mediate information about the true objects of his inquiry—stars and planets.

This concentration on the processes in the life space has, of course, its disadvantages, for example, the relative neglect of peripheral input or output which I have already mentioned. But in spite of these disadvantages, the gains from this kind of approach are very great. Brunswik, who as I mentioned before was certainly very much aware of the defects of Lewin's system, also stressed its positive aspects. He says:

> Encapsulation into the central layer . . . may be the least harmful of all the limitations which possibly could be imposed upon psychology: It may actually mean concentration upon the most essential phase in the entire process of life and of its ramifications. It may be the thing psychology has always been really after throughout its history [1943, p. 266].

I come now to the second part of this discussion, which deals more specifically with Lewin's notion of life space. Let us try to observe this notion *in statu nascendi,* so to speak, and to find out what were the primary experiences which led Lewin to develop it and to express it, at a later stage, in terms of topological concepts. I am aware of the fact that I am disregarding here the considerable influence Wertheimer and Köhler had on Lewin's thinking.

What I want to talk about is Lewin's first publication, a short paper in which he applied the concept of life space in a very interesting way, though the term is not used and *topology* does not yet appear. This paper was published in 1917 in the *Zeitschrift für* *angewandte Psychologie,* and it is entitled "Kriegslandschaft": "War Landscape." Lewin states that it deals with the phenomenology of landscape, and in it he describes how the environment appears to the soldier in trench warfare. He himself had served and had been wounded in the First World War.

This paper is fascinating to read in view of the later development of topological psychology. Many of the concepts which afterwards were defined in a systematic way appear here as descriptive concepts, for instance, boundary, direction, and zone.

To review this paper briefly: Lewin begins by saying that as the soldier approaches the front lines he experiences a peculiar transformation of the appearance of the landscape. The landscape at a greater distance from the front, which Lewin calls the peace landscape, seems to extend evenly on all sides almost to infinity. This landscape is without direction. Near the front the landscape seems to be bounded, the environment suddenly comes to an end. It has a direction, a front and a back, and this direction is not referred to the marching soldier but belongs to the environment itself. This transformation cannot be described simply as an awareness of increasing danger and eventual inaccessibility; it is experienced as a feature of the objective landscape.

Along the front lines there is a boundary zone whose characteristics become intensified as the enemy lines are approached. This boundary zone is to be distinguished from regions of danger. For instance, there may exist isolated danger islands, which are relatively distant from the front but exposed to enemy fire.

He then talks about the difference between peace things and battle things. By this he means not the difference between, for instance, a farmhouse and a cannon; he means that the same objects may be experienced in a different way according to whether they are seen in the context of peace or in the context of battle. He says:

> What lies within the battle zone belongs to the soldier as his legitimate property, not because he has gained it by force of arms, but because in the context of battle everything is seen as something to be used for military purposes. Even such barbaric acts as the burning of furniture in war cannot be compared to the same acts in peace time [1917, p. 445].

He describes the impression of incongruity he felt when he had to get straw for bedding or coal to warm his supper from a village in the battle zone. It seemed absurd to have to use battle things suddenly as peace things. The main characteristics of battle things have to do with protection against being seen or shot at by the enemy.

These samples may give an idea of this paper on the war landscape, about which Koffka (1935) writes that it is an

> exceedingly good and instructive description of a field with a very simple kind of inhomogeneity. [It is] a field which has a polar structure in one direction: the enemy's land on the one side and home and safety on the other. This vectorial property is a primary characteristic and determines the entire field, no other characteristic being entirely free from it [pp. 43-44].

Let us take a closer look at the notion of phenomenal field or life space as it is applied in this description of the war landscape. There are a great many puzzles and unsolved problems hidden in it. Whenever one tries to formulate what is really meant by it or what its implications are, one is led deeper and deeper into significant questions. Some of them are, I suppose, characteristic of every kind of cognitive psychology, others seem to be more specific to Lewinian theory.

Let us begin with the relation of the environmental part of the life space to the objective environment, or, to use Koffka's terms, the relation of the behavioral environment to the geographical environment. The geographical environment is the environment as described by physics or geography. Certainly the geographer would describe the war landscape in a way which is very different from Lewin's phenomenological description. He would characterize the hills and villages as to their location, extent, altitude, and so on, but not as to their function in giving protection from the enemy. Nevertheless, one cannot say that the "phenomenal" landscape which Lewin portrayed as representing the experiences of a typical soldier is entirely subjective. Though it includes more than the purely physical features of the environment, it still has a certain kind of objective existence. It contains the *functional possibilities* of the environment which do not vary according to the personal needs or biases of a subject in a particular situation. It refers to what a typical soldier can do and what he may suffer in this environment. These functional possibilities are objective in the sense that they are more or less valid for all persons in this environment. For instance, when a soldier enters a danger island, there exists a certain probability of his being wounded or killed, regardless of whether he is aware of the fact or not. Of course, whether or not he goes to a certain place will depend on this awareness; however, the concept of danger island can also be used in an objective sense though it is not a geographical or physical concept. It has to do with causal relationships existing in the environment. Could it be that this description of the war landscape does not after all describe the behavioral environment or life space, but something between the behavioral environment and the geographical environment?

Chein, in an interesting article (1954), has talked about a geo-behavioral environment, by which he seems to mean the environment as it would affect an average person, or even as it would affect a person typical of a certain group.

It appears that here we get into a problem which Floyd Allport (1955) has characterized as the inside-outside problem. We are dealing with an interaction between the person inside and the environment which is outside. Of course, we can leave it at that and talk about some kind of transaction and refuse to get involved in further analysis, but this does not lead very far. We usually attribute such an interaction more to one or more to the other of two poles, and that is what we do with the person-environment interaction.

When we talk about the person as opposed to the geographical environment, we attribute a minimum to the outside entities, that is, we attribute to the outside only those properties which it shows in interactions with the widest possible range of other objects, regardless of whether they are persons or inorganic objects. When we confront the person with the geo-behavioral environment we attribute to the outside a great deal more, namely, everything that persons have in common in the interactions with the environment. In a way, the average person is then attributed to the outside. In this way we can enter more and more on the accounts of the environment until the person shrinks to an undifferentiated point: the environment is then characteristic for one particular person at one particular moment.

However, the geographical environment is still with us, and the problem now arises of relating this physicalistic environment to the different, other, "enriched" environments. And we have not given up entirely the attribution to the person. We have to characterize these environments by saying: this is the environment for this group, or for this person. And why do we still call it environment when it is in some way attached to a particular person?

These questions have to do with the problems of intention or representation which every cognitive psychology has to meet in some way. Something belonging to the inside part, the person, is described in terms of the outside part, the environment. The so-called intervening variables can be related to environmental variables in two different ways: causally, or through intentionality. In stimulus-response theories the intervening variables are defined by the causal relation; in cognitive theories they are defined both by the causal relation and by the relation of intention or reference. When we think about mentalistic concepts we are apt to be so occupied with the difficulty of anchoring them in observables that we forget that they also have this characteristic of intentionality which places them somewhat apart from other scientific concepts.

Lewin does not treat this problem systematically. However, he comes into contact with it, for instance, when he talks about the life-space dimensions of time and reality. He says that one has to distinguish psychological facts from their referents. A present psychological fact can refer to something that lies in the future or in the past, and an existing psychological fact can refer to something unreal. He proposed the following general formulation: "The existence or nonexistence and the time index of a psychological fact are independent of the existence or nonexistence and time index of the fact to which its content refers" (1936, p. 38). The fact that I will get on a train for Kansas tomorrow morning affects my behavior today: it is part of my present life space although it will not happen until tomorrow.

This duality of psychological fact and its referent has sometimes been treated as a case of symbolic reference. Thus Angyal says in his book *Foundations for a Science of Personality:* ". . . the function of the so-called mental process is essentially a semantic one. By this we mean that 'psychological contents' function as symbols and that psychological processes are operations with these symbols" (1941, p. 56). There is no question that the concept of symbol is useful here as a thought model, but it is not entirely satisfactory. A word can be called a symbol for a thing. In this case both symbol and referent are present in awareness. The concept is used in this way by Cassirer (1944) when he says that man is the symbolic animal and that the world of man is shaped by the symbolic systems of language, religion, science, and so on. When Angyal talks about symbolic reference he means the relation between a life-space content and something outside the life space, for instance, something belonging to the geographical environment. Though this relation is similar to the relation between word and thing, it has to be distinguished from it. However, in spite of this difference I will go on using the terms symbol or symbolic reference in the way Angyal uses them.

Before the advent of cognitive field theory, association theory employed concepts involving symbolic reference, as, for instance, "idea," or "image." These concepts have two homes, so to speak. On the one hand they have a place as psychological facts in a network of causal relations; that is, they are functionally related to each other in such a way that the presence of one idea tends to evoke another idea. But on the other hand, they are also connected with the environment, by this peculiar relation of representation: each idea stands for something, often for a content of the objective world. It seems to be a characteristic of this theory that it is the single idea that shows a representational function, while the relations between ideas do not symbolize the environment. The fact that two ideas are associated does not in itself refer to a relation existing in the environment.

With the idea of field representation we come to an entirely new notion. Not only single entities but also the relation between entities, for instance, part-whole or neighboringness relations, have a representational function. Instead of a collection of symbols we find something like a map. Or instead of a list of words as in a dictionary, we find something which includes grammar.

This new notion is, of course, implicit in the Gestalt-psychological concepts of cognitive structure. But one might say that its most consistent elaboration is found in Lewin's construct of life space. The parts of the life space are identified by their referents, they are usually characterized by the words we use to describe the objective environment. And not only the parts, but the relations between the parts, have this representational function. For instance, the fact that two regions of the life space are adjacent refers to, or symbolically represents, the fact that the referents of these regions stand in some neighboringness relation.

Since the life space is involved in this relation of intentionality, it is a kind of construct that is not found in other sciences. Angyal says: "The symbolic relationship is quite unique in that it does not occur, as far as we know, outside the psychological realm" (1941, p. 58). Maybe the reason why many psychologists shy away from using mentalistic concepts is not only the difficulty of operational definition but also this uniqueness.

A word may be added about the concept of "field" as Lewin uses it. Critics have pointed out that there are important differences between it and the field as the physicist understands it (London, 1944). Lewin himself noted this difference, which shows in, for instance, the definition of direction in the life space (Lewin, 1938, p. 40). This direction depends not only on the state of the immediate surroundings, but on the field at large, a conception which is not in harmony with the physical field concept, at least not with the classical one. I feel that this difference between life space and physical field is also connected with the fact that the life space shows this feature of intentionality.

I want to add a few further questions which arise when we consider the life-space contents as symbols. Words are symbols of things, and they can be classified in two different ways: on the one hand according to their own properties, their length maybe, or their first letter, and on the other hand according to their meaning. Thus they belong to two orders, they have two homes. Is that also true of life-space contents? And how about causal connections: words as such do not really interact causally, even if we put them on paper. They are not like chemical substances which interact when one mixes them, they do not spontaneously group themselves in certain ways. But the life-space contents do interact, and if they are symbols, they are symbols that influence each other. Should their interaction be understood in terms of their meaning, or in terms of their own properties, whatever those are? These are some of the questions we are faced with when we conceive of the life space as something having symbolic reference.

I must append one more remark here. So far I have considered only the environmental part of the life space. According to Lewin there exists another part, the person, and he uses basically different theoretical notions in treating it. The representation of the person is not a map: structurally it is more similar to association theory. Each single region of the person can be considered to be a symbol of an activity, but the relations between them do not show symbolic reference in the sense in which this is true for the relations of neighboringness between regions of the environment. As in association theory, they stand for functional relations between psychological facts, especially for possibilities of tension communication.

In this paper I have dealt mainly with the relation of the person to the environment in Lewin's theory, and also with the manifold problem of intentionality which is implied in it. I have tried to communicate an impression I get whenever I try to understand Lewin's basic notions, and that is that they are, so to speak, visions, not at all completely formulated and explicated; that they have a wealth of implicit meaning which has not yet been exhausted, and that they are therefore still full of promise for further development.

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